ARRAY INDUCTION-RTAP
SHALLOW FOCUSED ELECTRIC
LOG

Weatherford®

COMPANY	GREAT WESTERN O&G Co
WELL	PASTLE IC 22-342 HC
FIELD	WATTENBERG
PROVINCE/COUNTY	WELD
COUNTRY/STATE	U.S.A / COLORADO
LOCATION	SHL: 498 FSL & 250 FWL

SEC 12	TWP 3N	RGE 68W	Other Services
Latitude			MPD/MDN
Longitude			
API Number	05-123-38972		

Permanent Datum GL, Elevation 4927 feet
Log Measured From KB
Drilling Measured From KB

Elevations:	feet
KB	4943.00
DF	4943.00
GL	4927.00

Date	27-AUG-2014			
Run Number	1			
Service Order	3474-96277194			
Depth Driller	7605.00	feet		
Depth Logger	6550.00	feet		
First Reading	6547.00	feet		
Last Reading	100.00	feet		
Casing Driller	1040.00	feet		
Casing Logger	1040.00	feet		
Bit Size	9.875	inches		
Hole Fluid Type	WBM			
Density / Viscosity	10.00 lb/USg		48.00 SEC/QT	
PH / Fluid Loss	9.80			
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.92 @104.2	ohm-m		
Rmf @ Measured Temp	0.74 @104.2	ohm-m		
Rmc @ Measured Temp	1.10 @104.2	ohm-m		
Source Rmf / Rmc	FLOWLINE			
Rm @ BHT	0.53 @186.0	ohm-m		
Time Since Circulation	6 HOURS			
Max Recorded Temp	186.00	deg F		
Equipment / Base	13173	CASPER		
Recorded By	C. STAAKE			
Witnessed By	J. LOFTON			

BOREHOLE RECORD

Last Edited: 26-AUG-2014 16:12

Bit Size inches	Depth From feet	Depth To feet
8.750	1040.00	7605.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	9.625	0.00	1040.00	36.00

REMARKS

SOFTWARE VERSION: 14.01.3220

SHA, MCG, MDN, MPD, MISD, SKJ, MFE, AND MAI RAN IN COMBINATION.

HARDWARE: MDN: DUAL BOWSPRINGS
MPD: 8" PROFILE PLATE
MISD: DUAL BOWSPRINGS
MAI: 0.5" STAND OFF

TOTAL HOLE VOLUME FROM TD TO SURFACE CASING = 2320 CUBIC FEET.

ANNULAR VOLUME WITH 7 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 1410 CUBIC FEET.

2.68 G/CC SANDSTONE DENSITY MATRIX USED TO DISPLAY POROSITY.

TIGHT PULLS, BOREHOLE SIZE AND RUGOSITY WILL AFFECT REPEATABILITY AND DATA QUALITY.

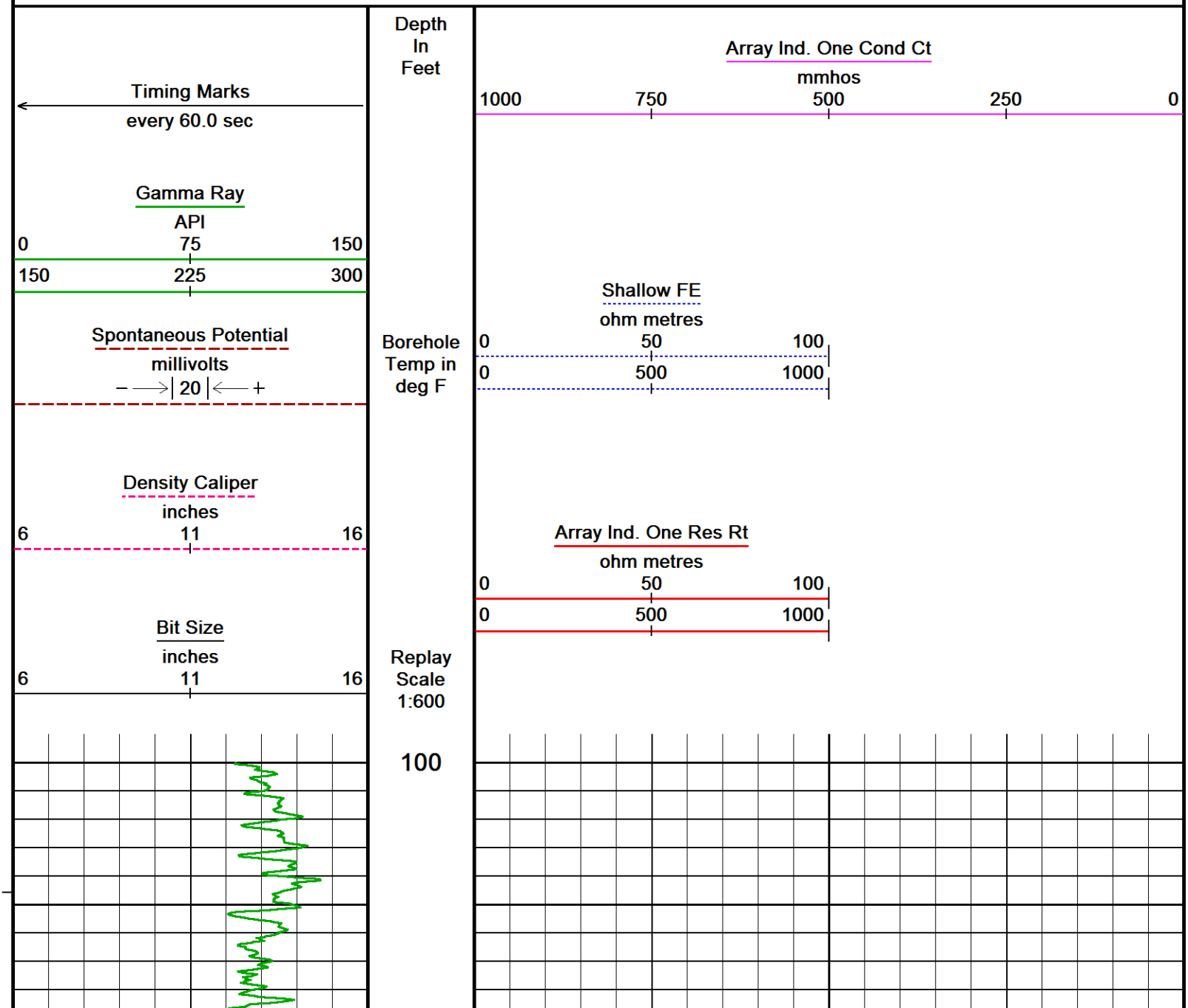
ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

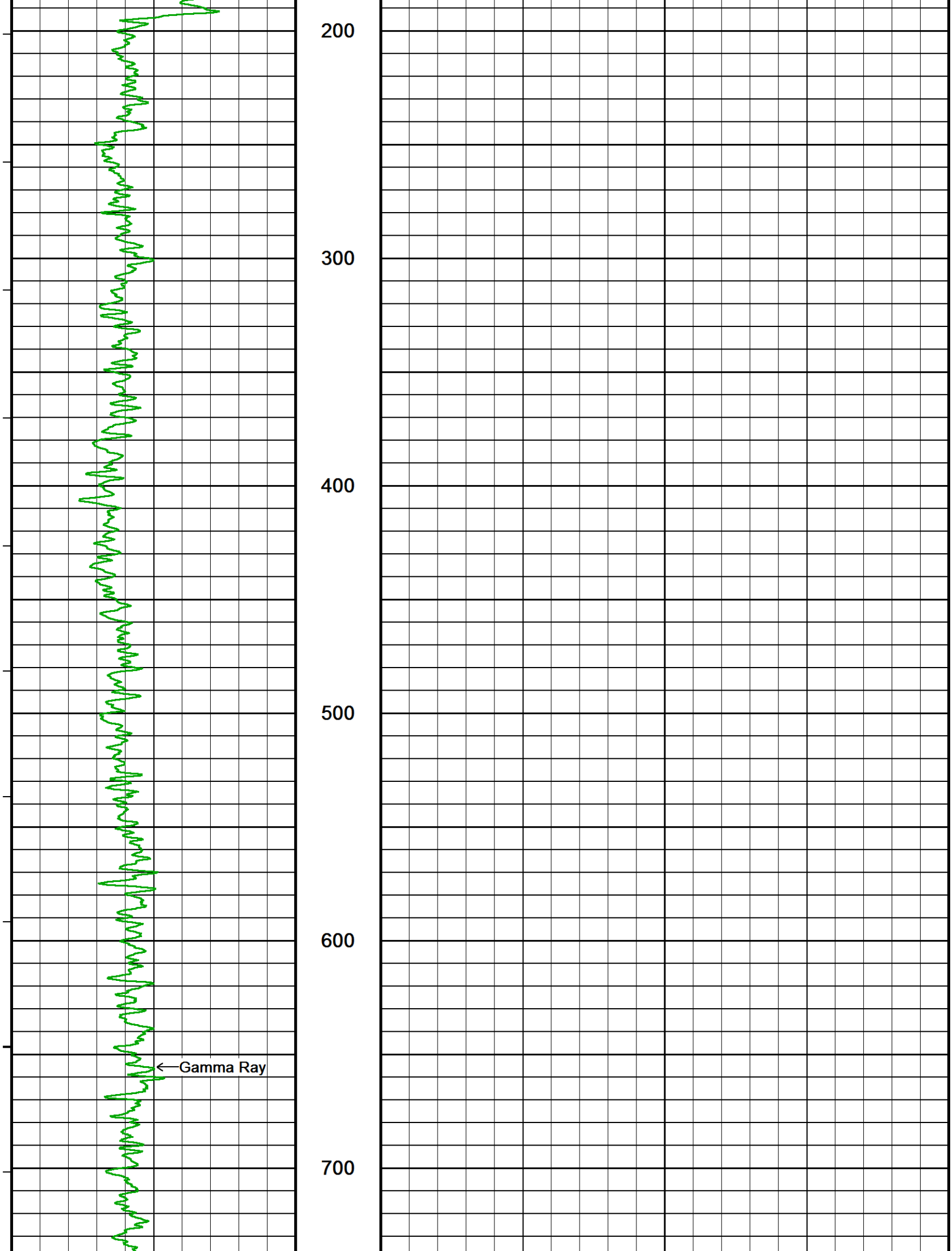
ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

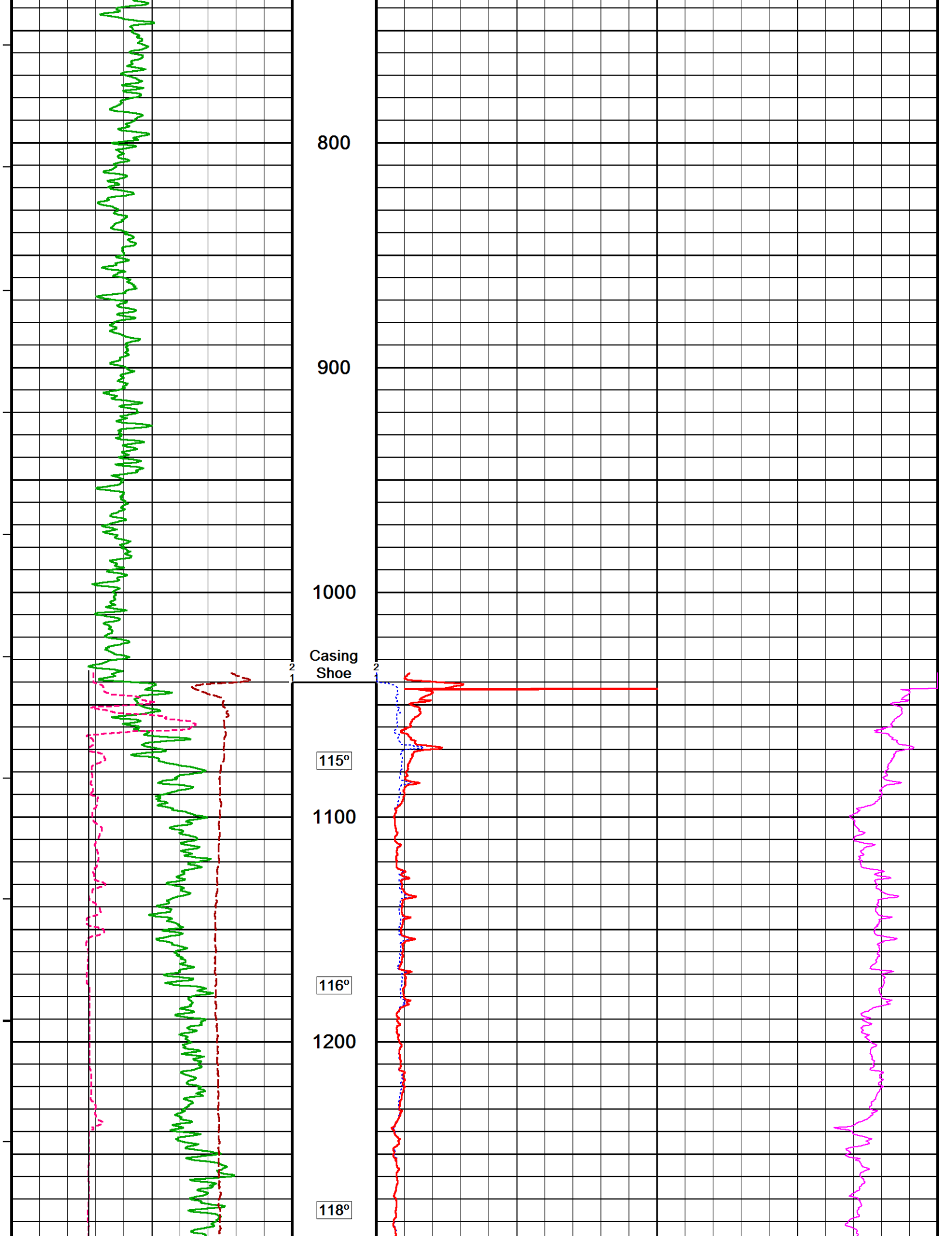
CALIPER CLOSED AT 1572 FT DURING A TIGHT PULL

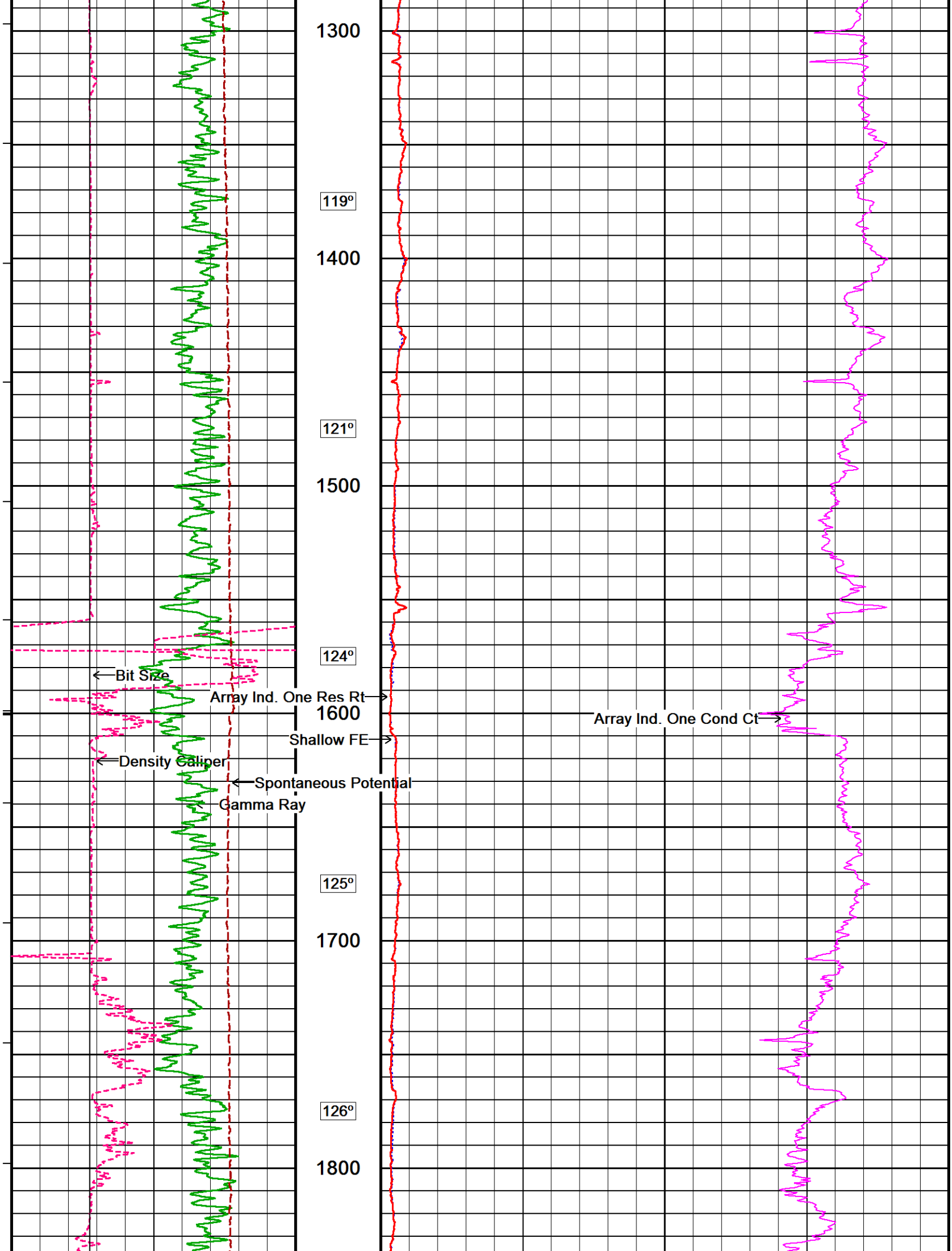
2 INCH MAIN LOG DSC

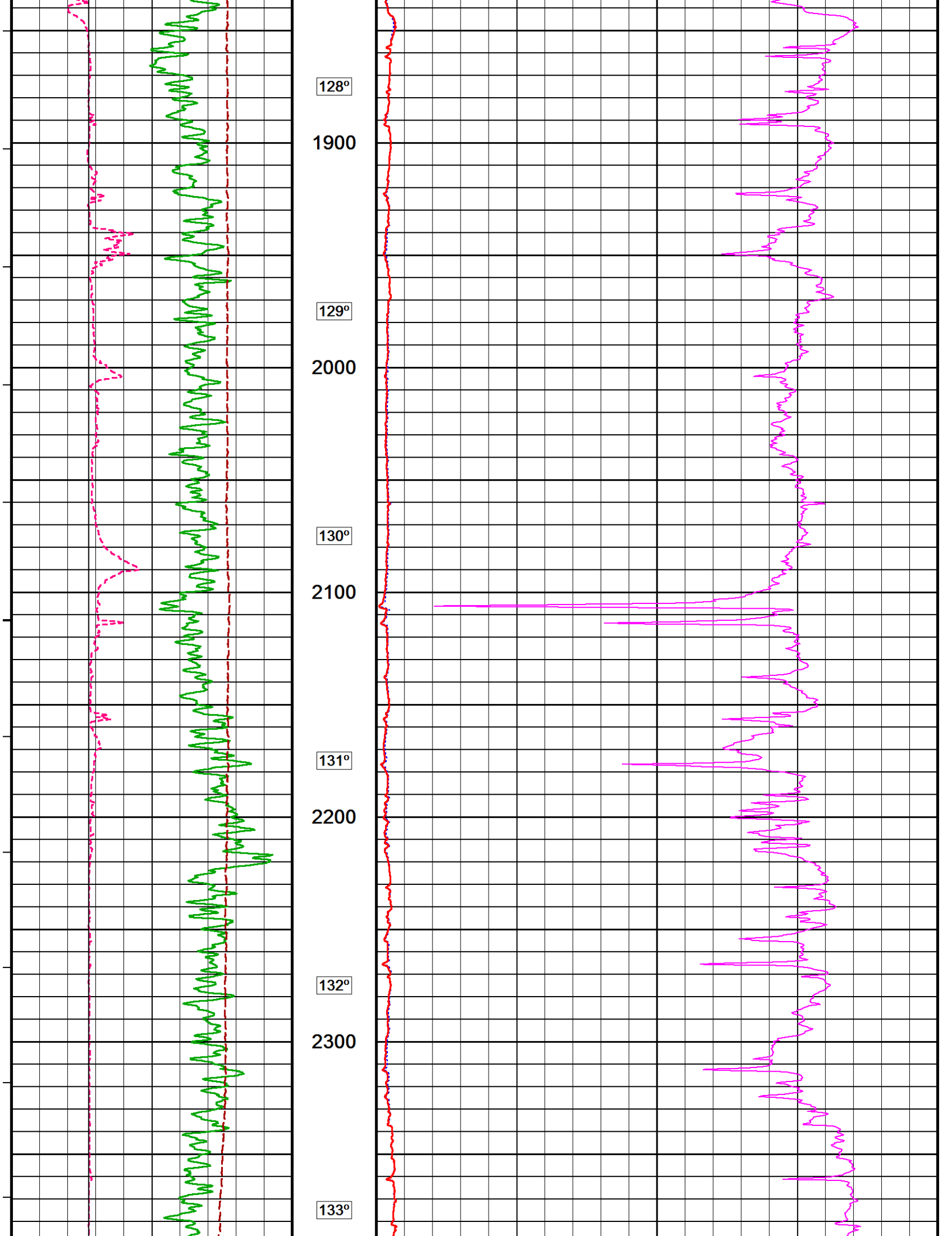
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 27-AUG-2014 05:04
Filename: C:\Logs\Great Western\Pastle IC 11-342 HC\Main Pass.dta
Recorded on 27-AUG-2014 02:20
System Versions: Logged with 14.01.3220 Plotted with 14.01.3220

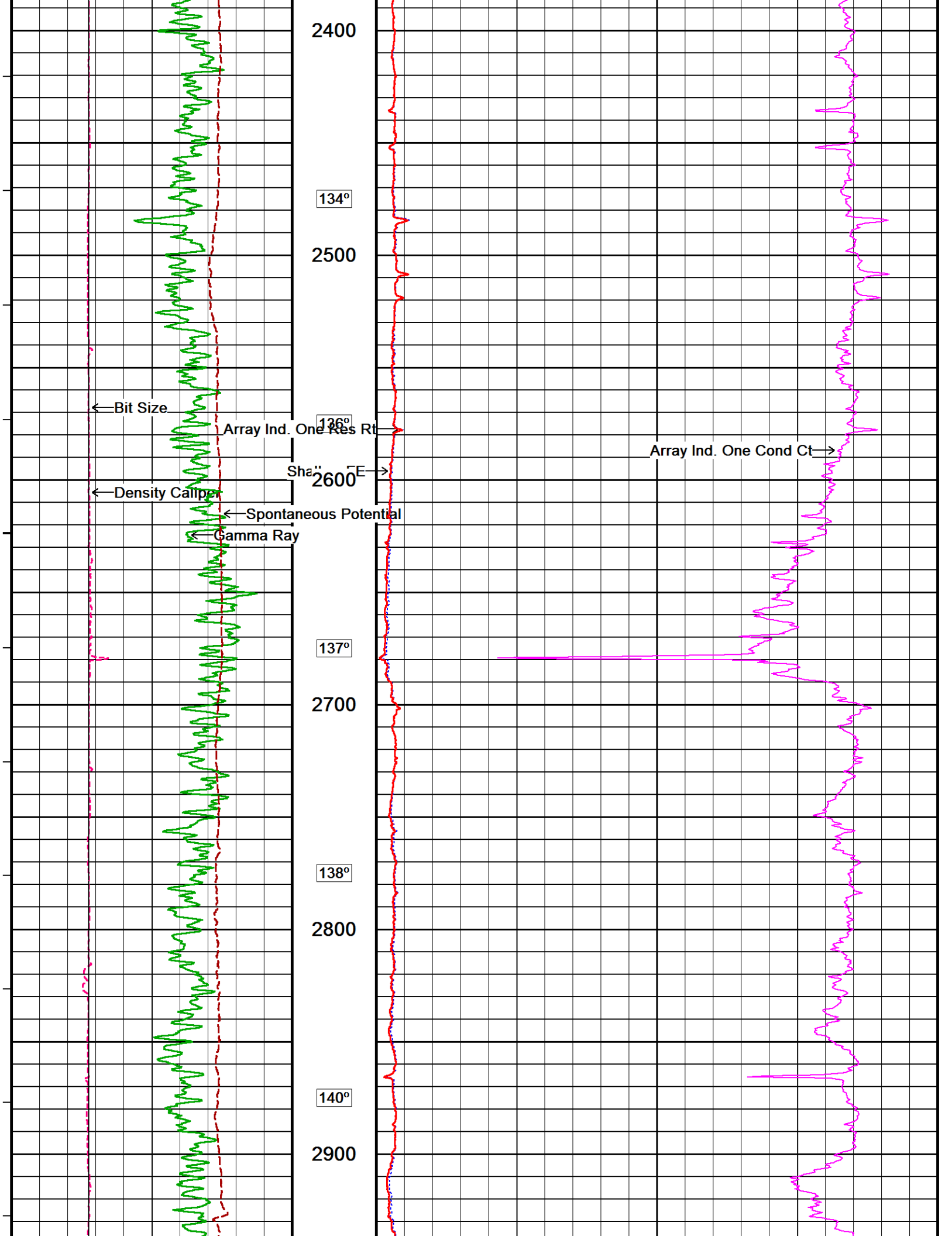


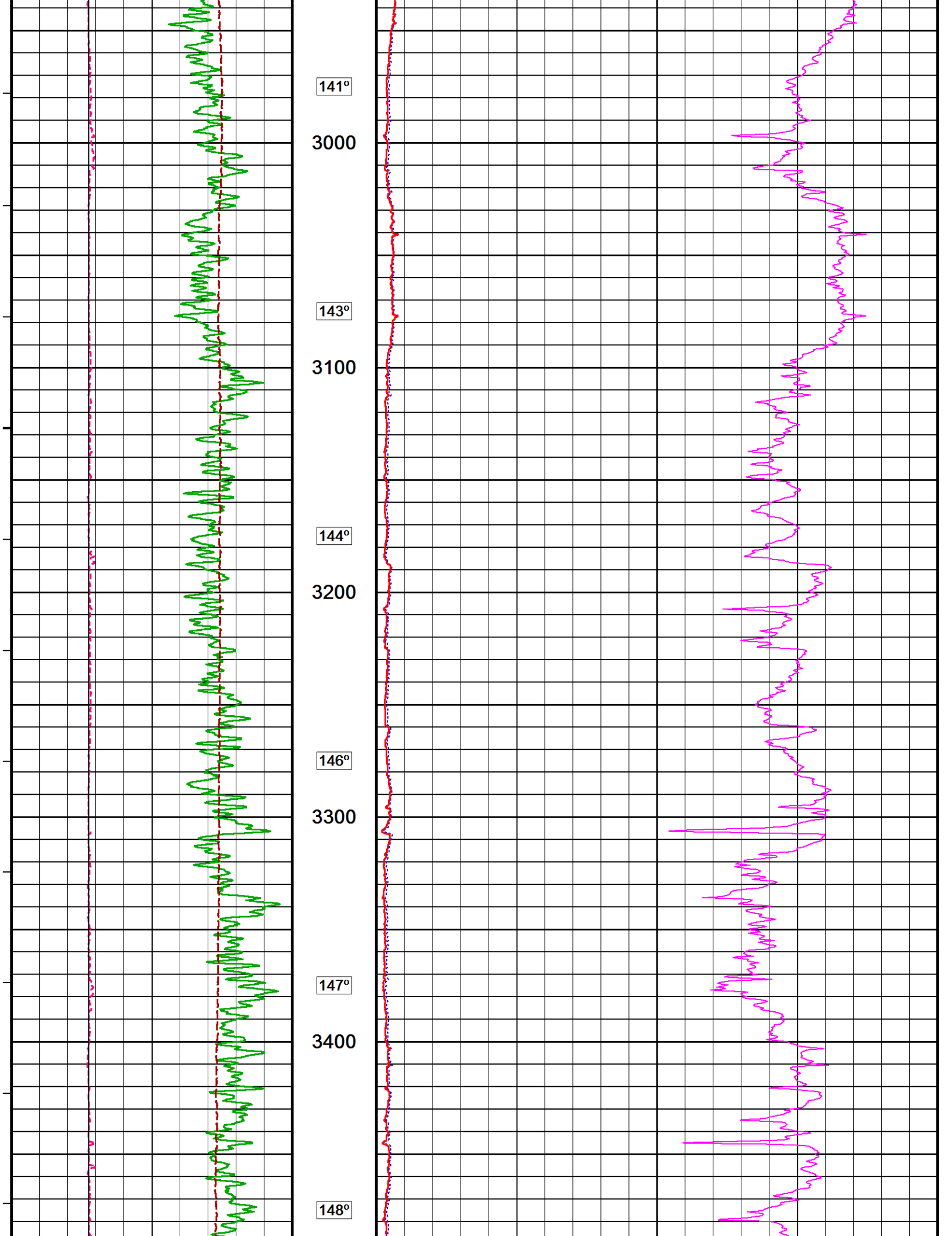

200
300
400
500
600
700
Gamma Ray

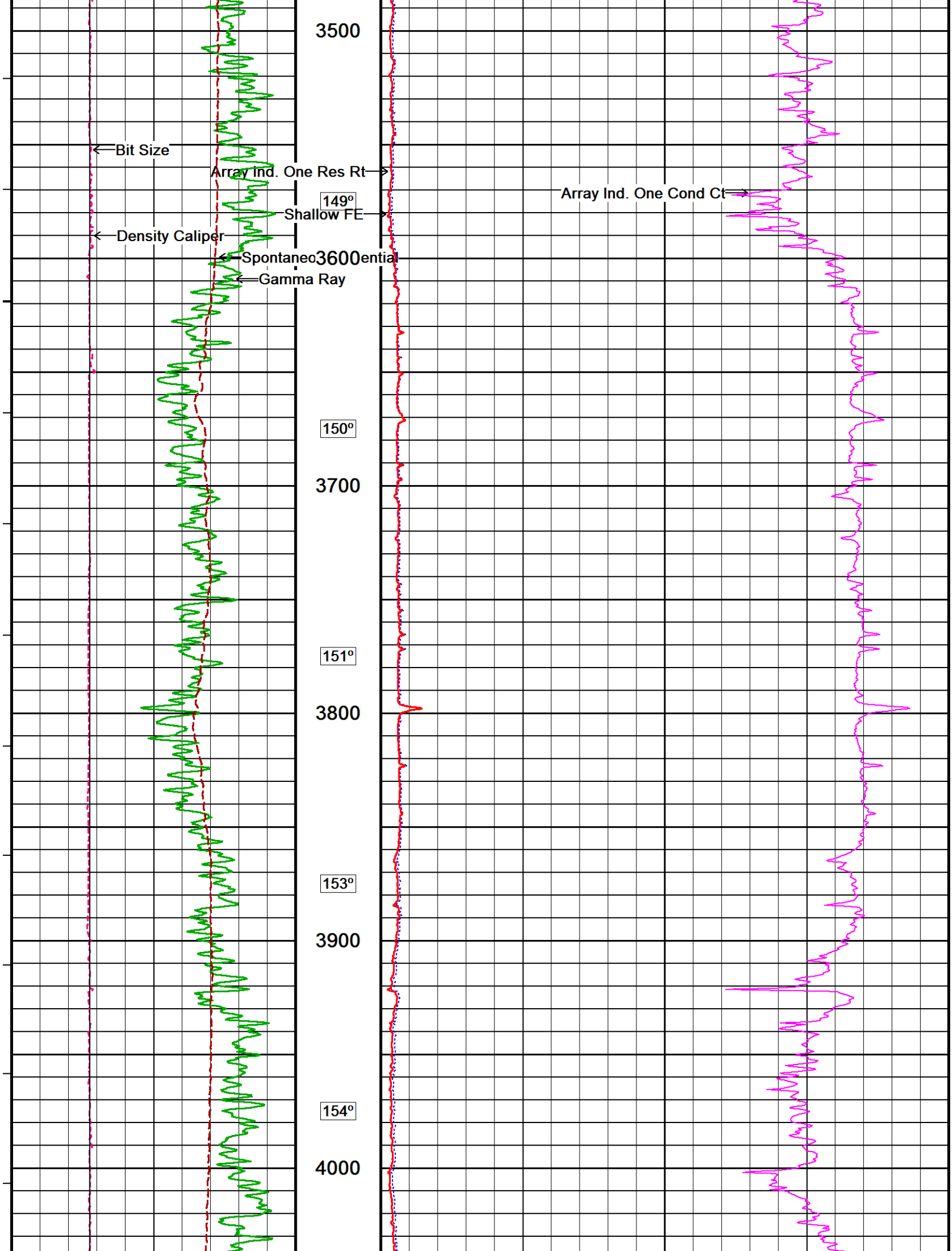

800
900
1000
Casing
Shoe
115°
1100
116°
1200
118°

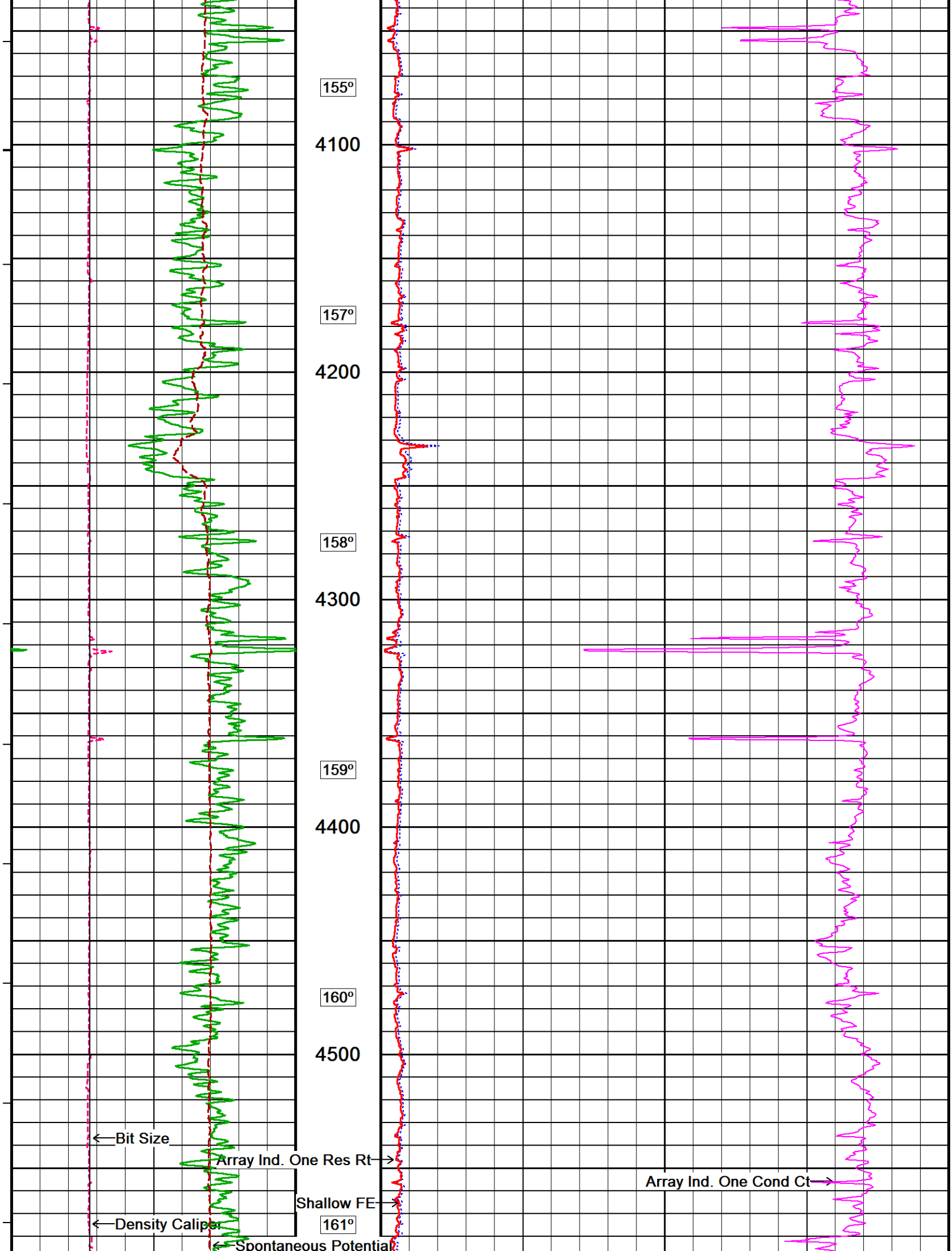

1300
119°
1400
121°
1500
124°
Bit Size
Array Ind. One Res Rt
1600
Array Ind. One Cond Ct
Shallow FE
Density Caliper
Spontaneous Potential
Gamma Ray
125°
1700
126°
1800

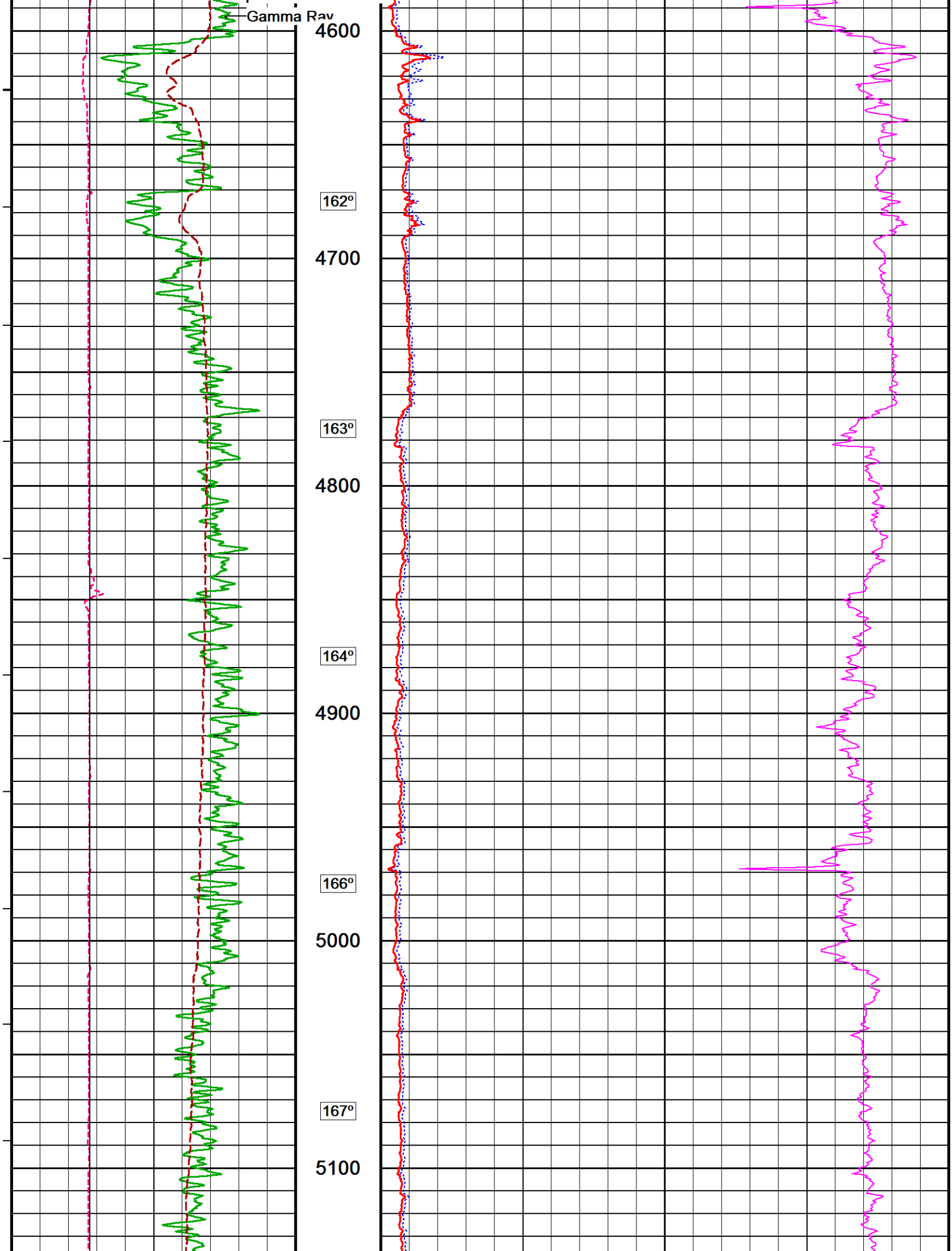

128°
1900
129°
2000
130°
2100
131°
2200
132°
2300
133°

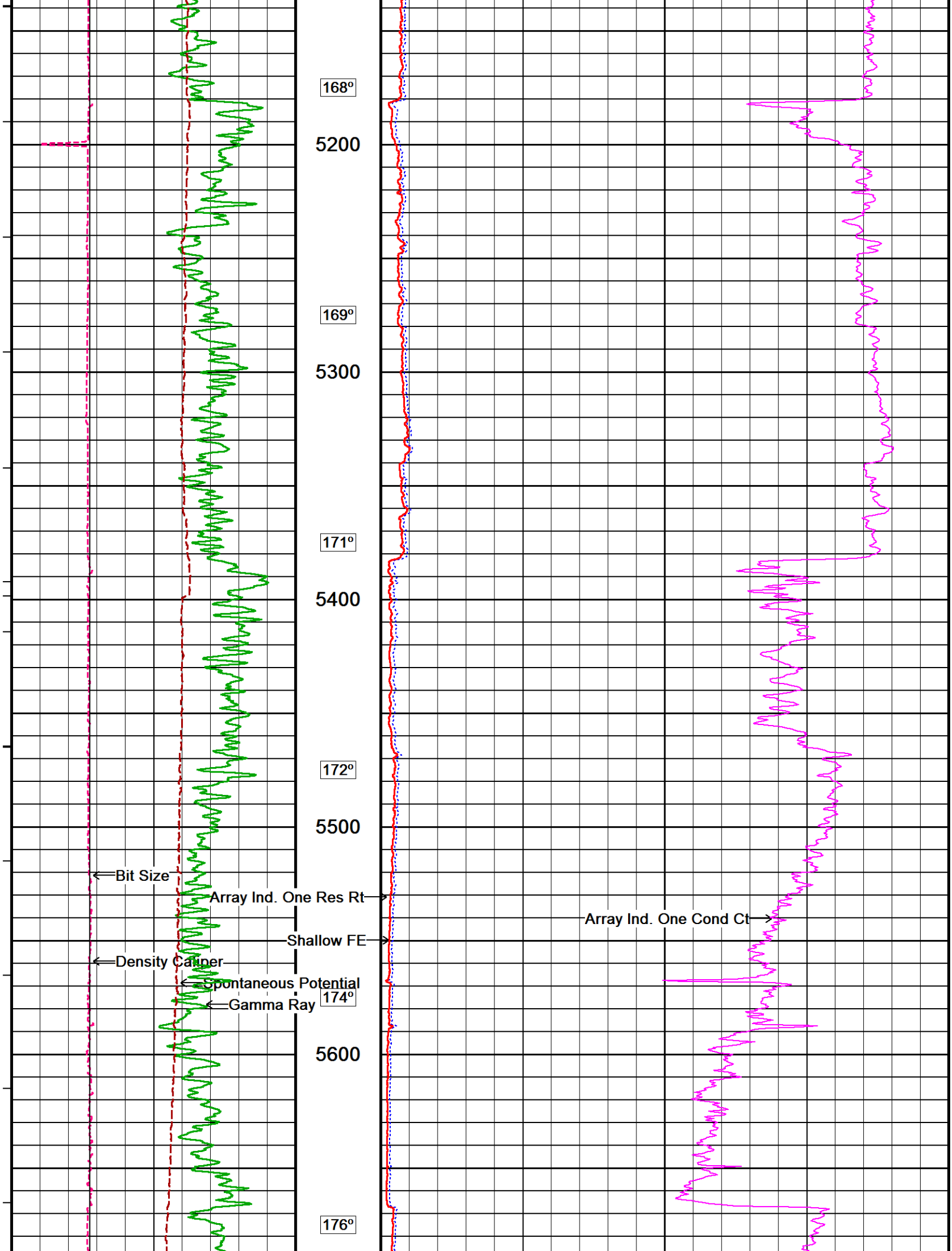

2400
134°
2500
Bit Size
136°
Array Ind. One Res Rt
Array Ind. One Cond Ct
2600
Density Caliper
Spontaneous Potential
Gamma Ray
137°
2700
138°
2800
140°
2900

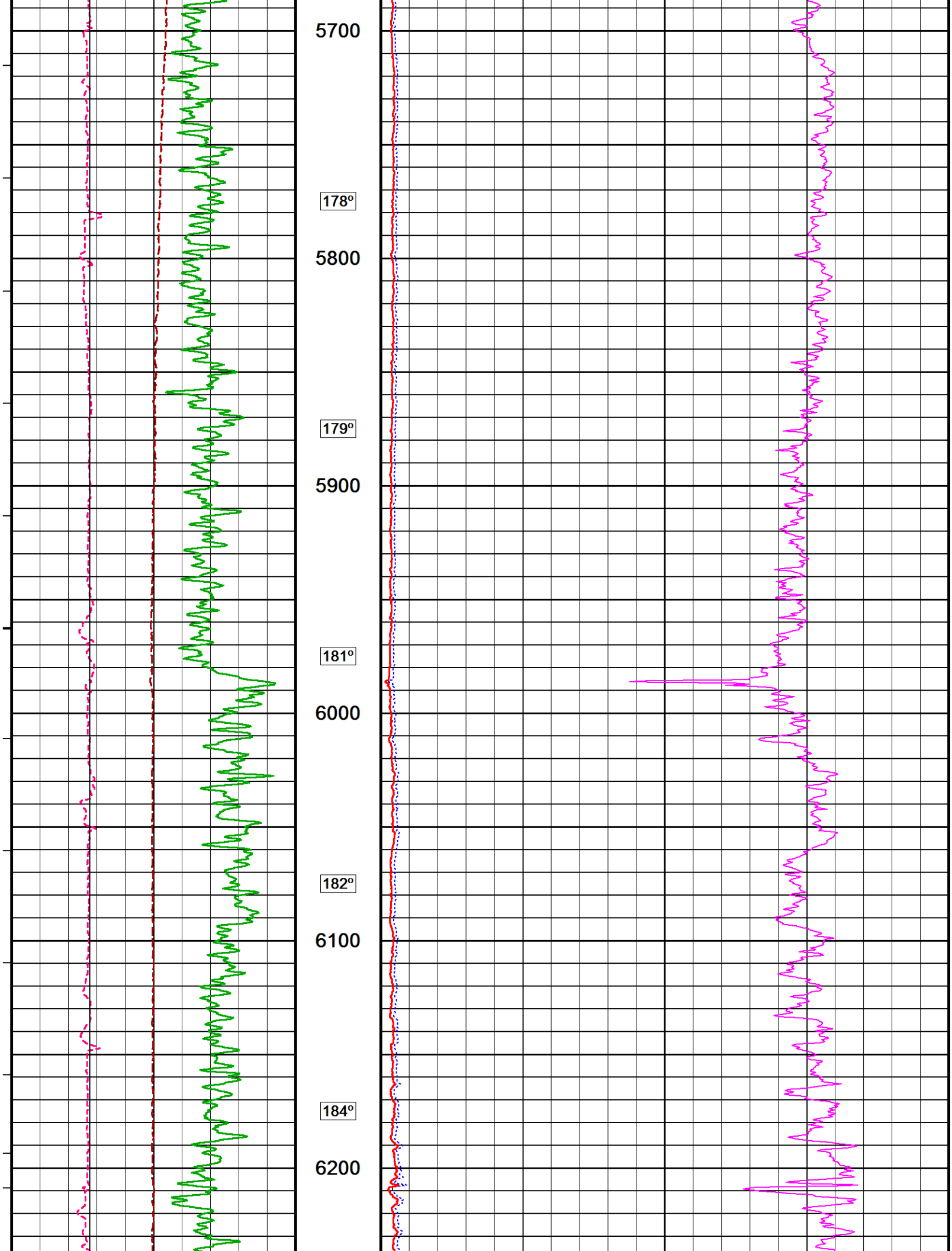

141°
3000
143°
3100
144°
3200
146°
3300
147°
3400
148°

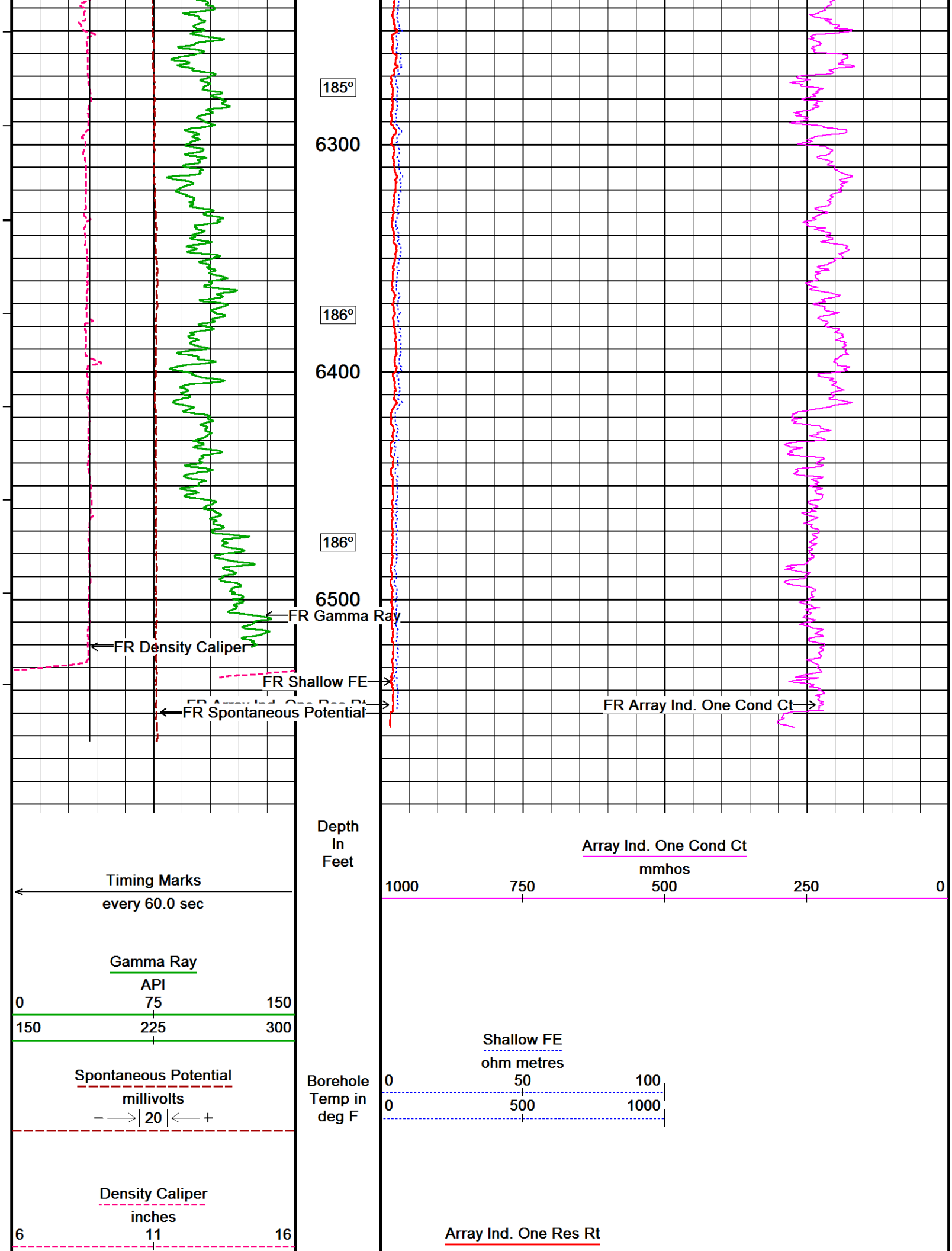

3500
Bit Size
Array Ind. One Res Rt
149°
Shallow FE
Array Ind. One Cond Ct
Density Caliper
Spontaneo
3600
ential
Gamma Ray
150°
3700
151°
3800
153°
3900
154°
4000


155°
4100
157°
4200
158°
4300
159°
4400
160°
4500
161°
Bit Size
Array Ind. One Res Rt
Shallow FE
Density Caliper
Spontaneous Potential
Array Ind. One Cond Ct


Gamma Ray
4600
162º
4700
163º
4800
164º
4900
166º
5000
167º
5100


168°
5200
169°
5300
171°
5400
172°
5500
174°
5600
176°
Bit Size
Array Ind. One Res Rt
Shallow FE
Density Caliper
Spontaneous Potential
Gamma Ray
Array Ind. One Cond Ct


5700
178°
5800
179°
5900
181°
6000
182°
6100
184°
6200


185°
6300
186°
6400
186°
6500
FR Gamma Ray
FR Density Caliper
FR Shallow FE
FR Spontaneous Potential
FR Array Ind. One Cond Ct
Depth
In
Feet
Array Ind. One Cond Ct
mmhos
1000
750
500
250
0
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Shallow FE
ohm metres
0
50
100
Borehole
Temp in
deg F
0
500
1000
Spontaneous Potential
millivolts
– 20 +
Density Caliper
inches
6
11
16
Array Ind. One Res Rt

ohm metres
0 50 100
0 500 1000

Bit Size
inches
6 11 16

Replay
Scale
1:600

Depth Based Data - Maximum Sampling Increment 10.0cm
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2 INCH MAIN LOG DSC

5 INCH MAIN LOG DSC

Depth Based Data - Maximum Sampling Increment 10.0cm
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System Versions: Logged with 14.01.3220 Plotted with 14.01.3220

Plotted on 27-AUG-2014 05:04
Recorded on 27-AUG-2014 02:20

Depth
In
Feet

Timing Marks
every 60.0 sec

DST Uphole Tension
pounds
10000 5000 0
0 -5000 -10000

Gamma Ray
API
0 75 150

Borehole
Temp in
deg F

Spontaneous Potential
millivolts
– → | 20 | ← +

Density Caliper
inches
6 11 16

Bit Size
inches
6 11 16

Replay
Scale
1:240

Shallow FE (Phase Corr.)
ohm metres
0.20 2000
1 10 100 1000

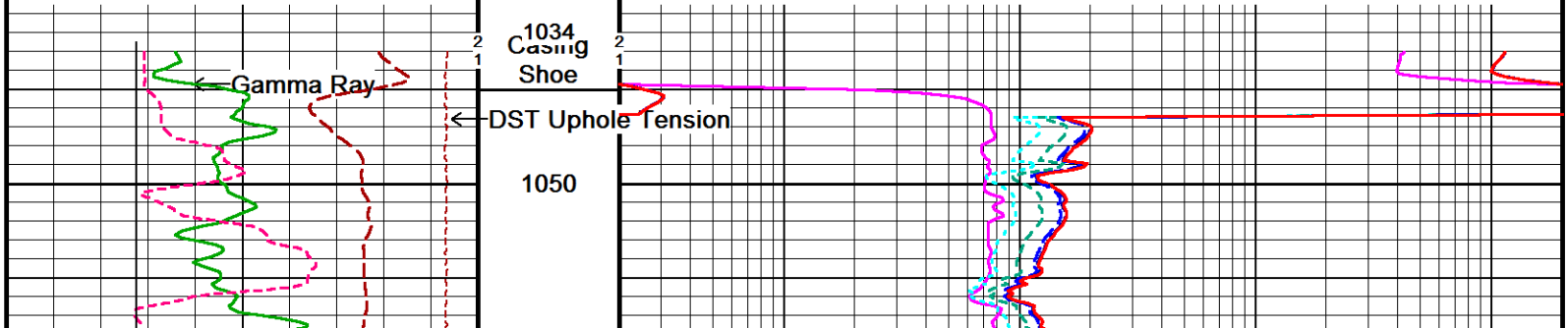
Array Ind. One Res 30
ohm metres
0.20 2000
1 10 100 1000

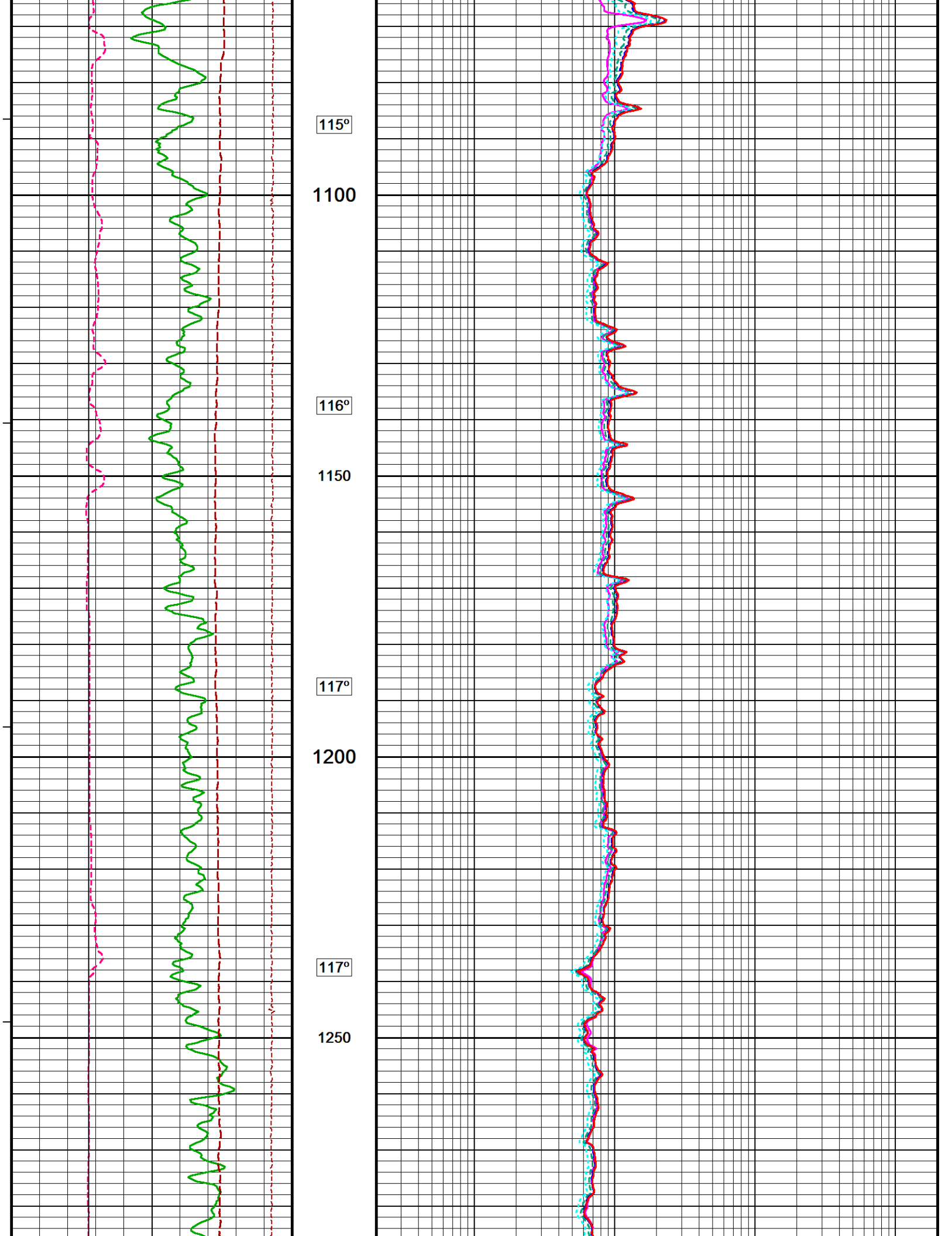
Array Ind. One Res 40
ohm metres
0.20 2000
1 10 100 1000

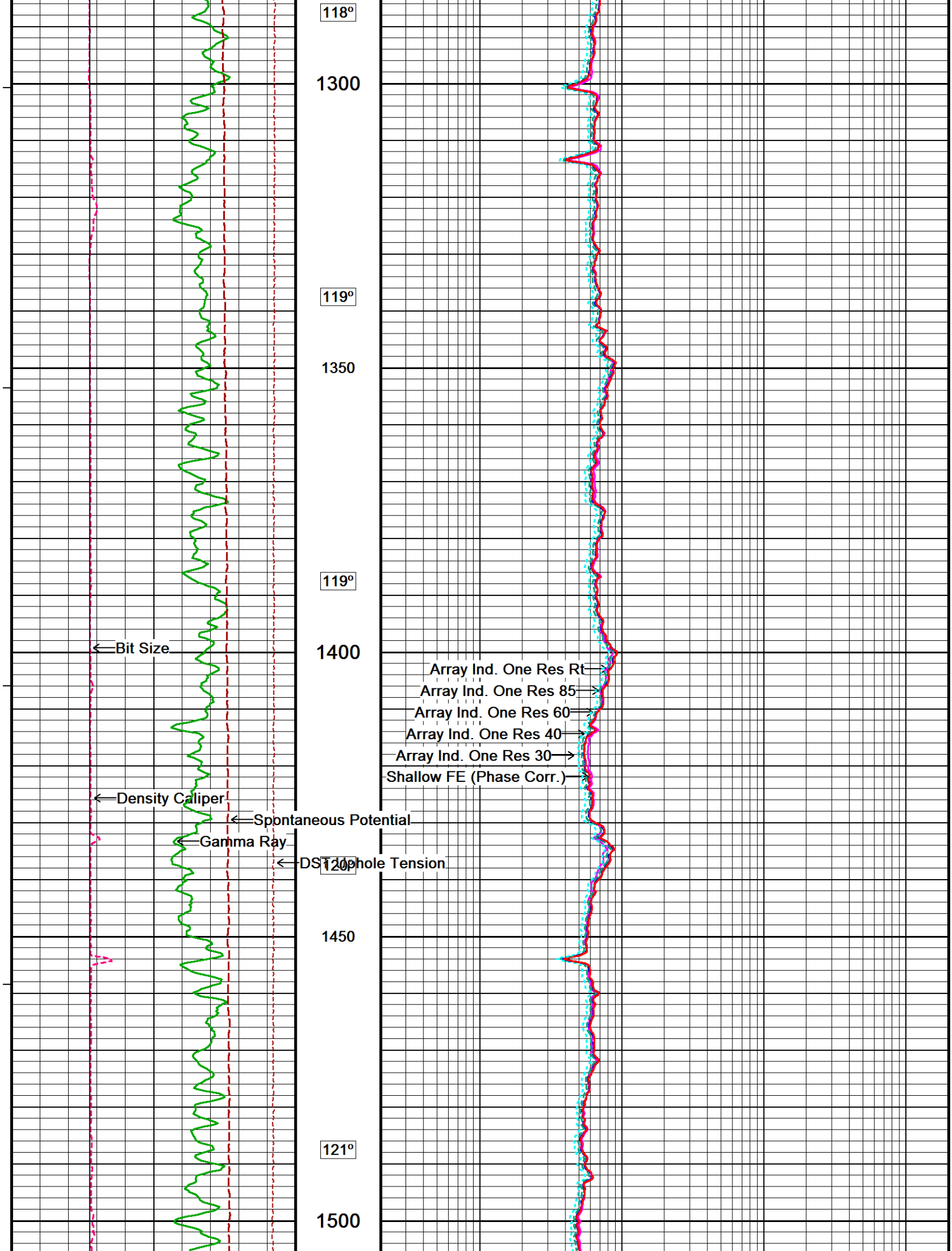
Array Ind. One Res 60
ohm metres
0.20 2000
1 10 100 1000

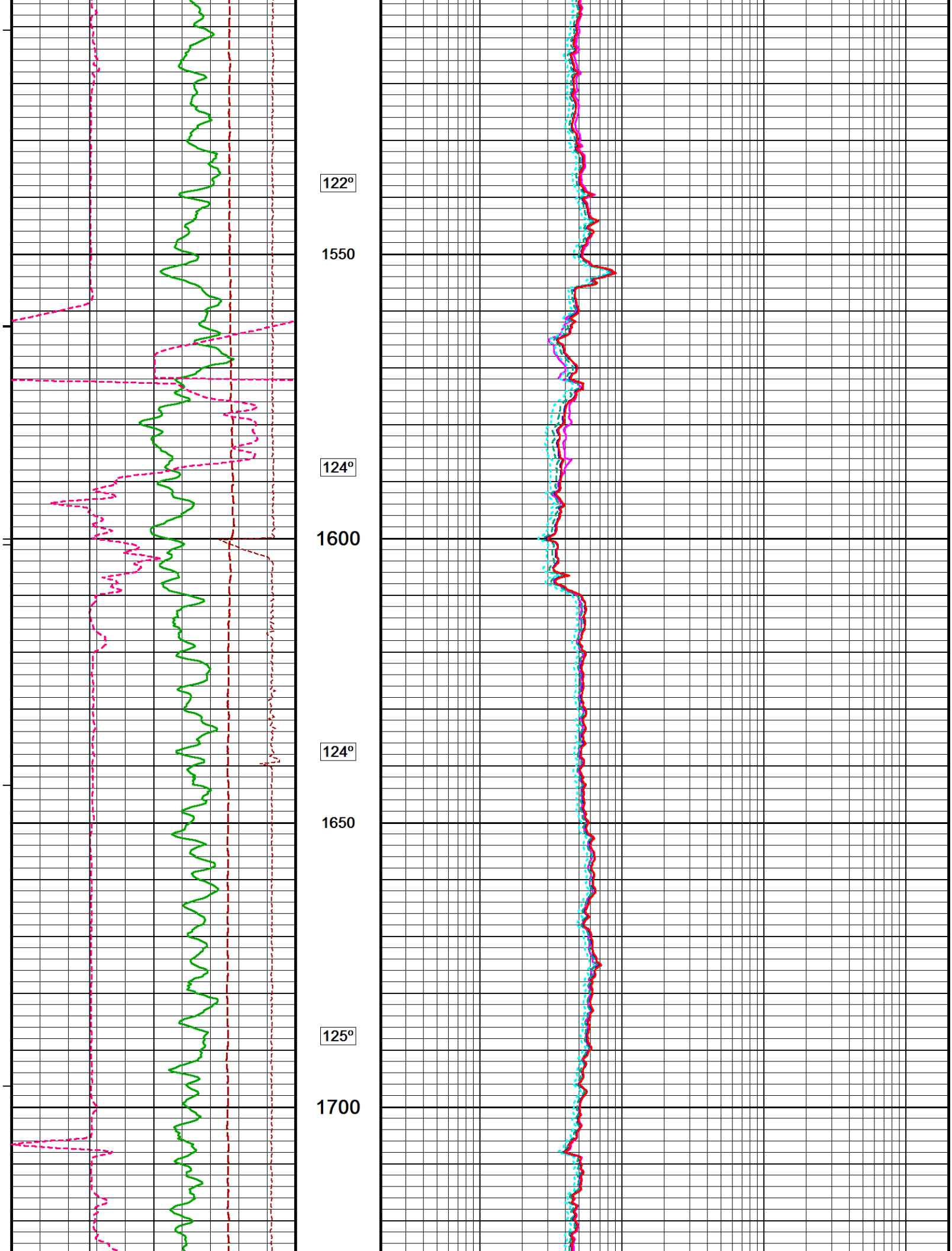
Array Ind. One Res 85
ohm metres
0.20 2000
1 10 100 1000

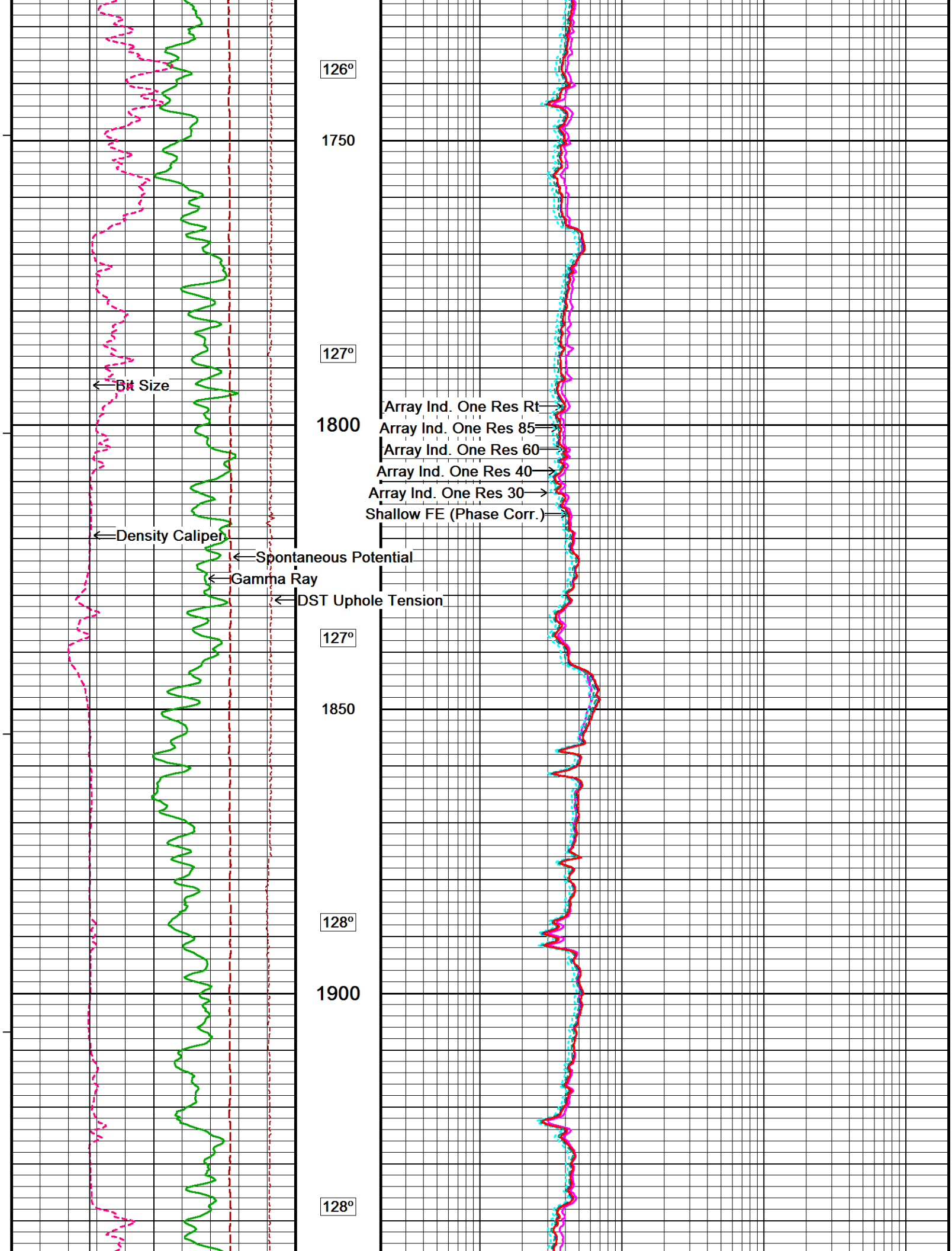
Array Ind. One Res Rt
ohm metres
0.20 2000
1 10 100 1000

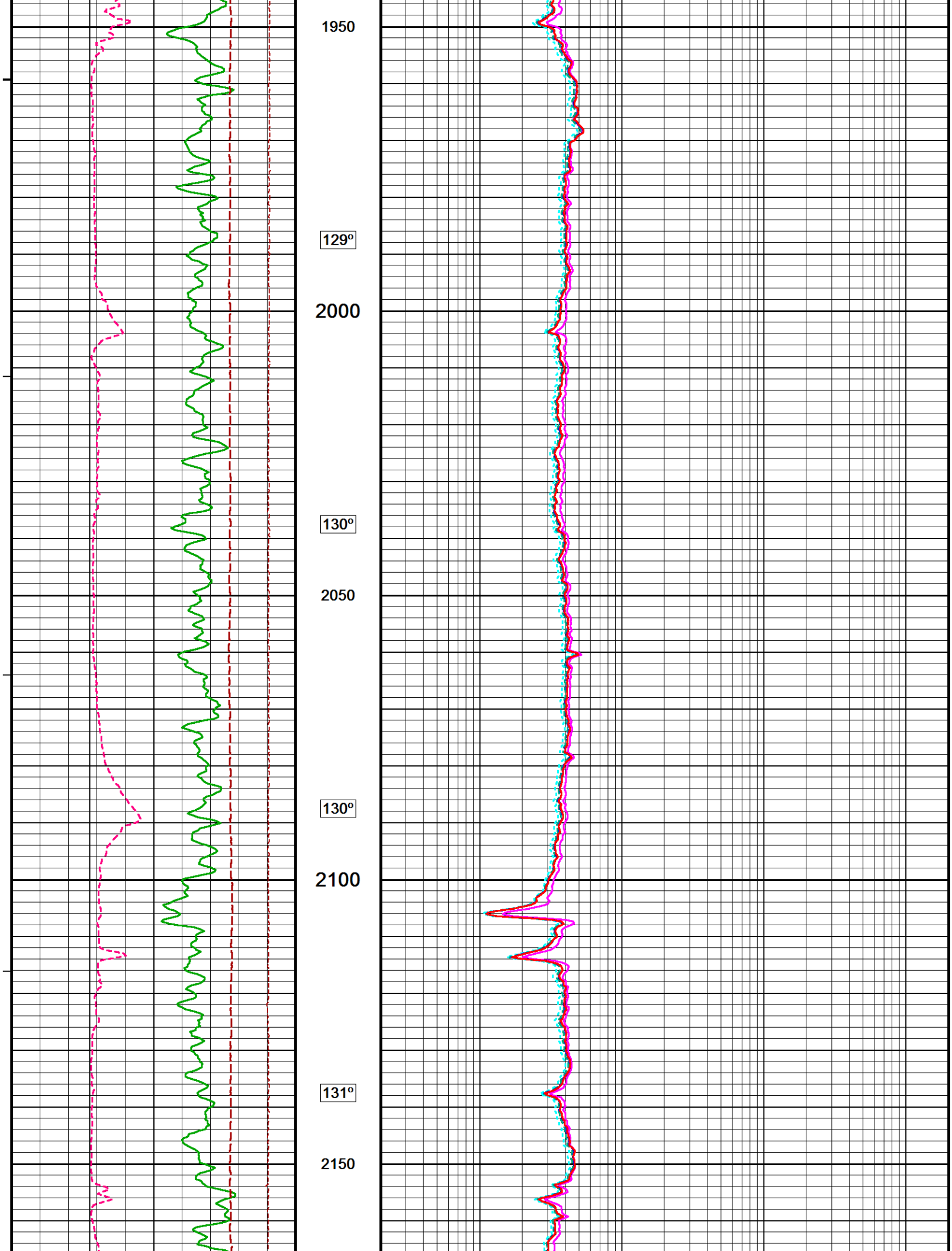


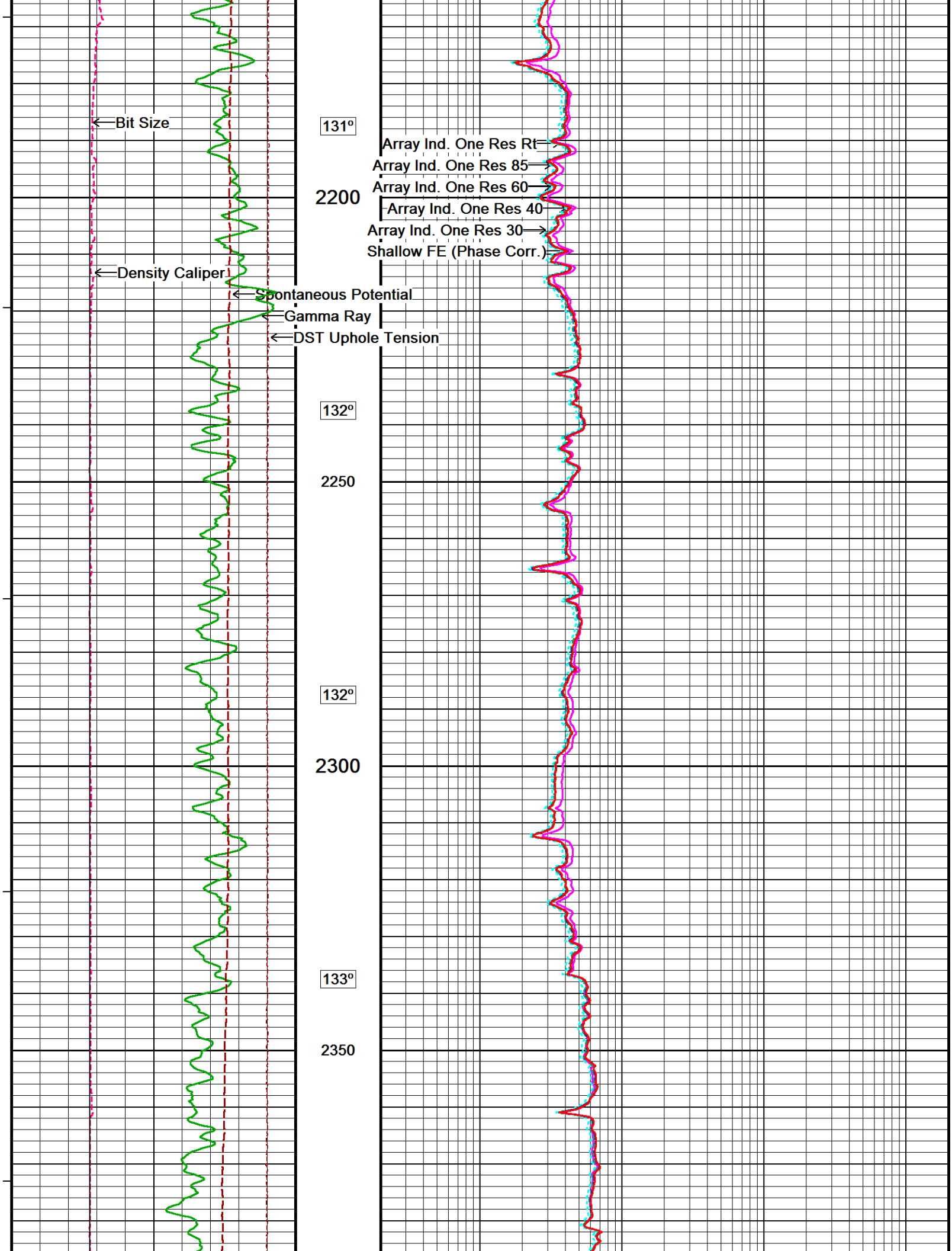

115°
1100
116°
1150
117°
1200
117°
1250

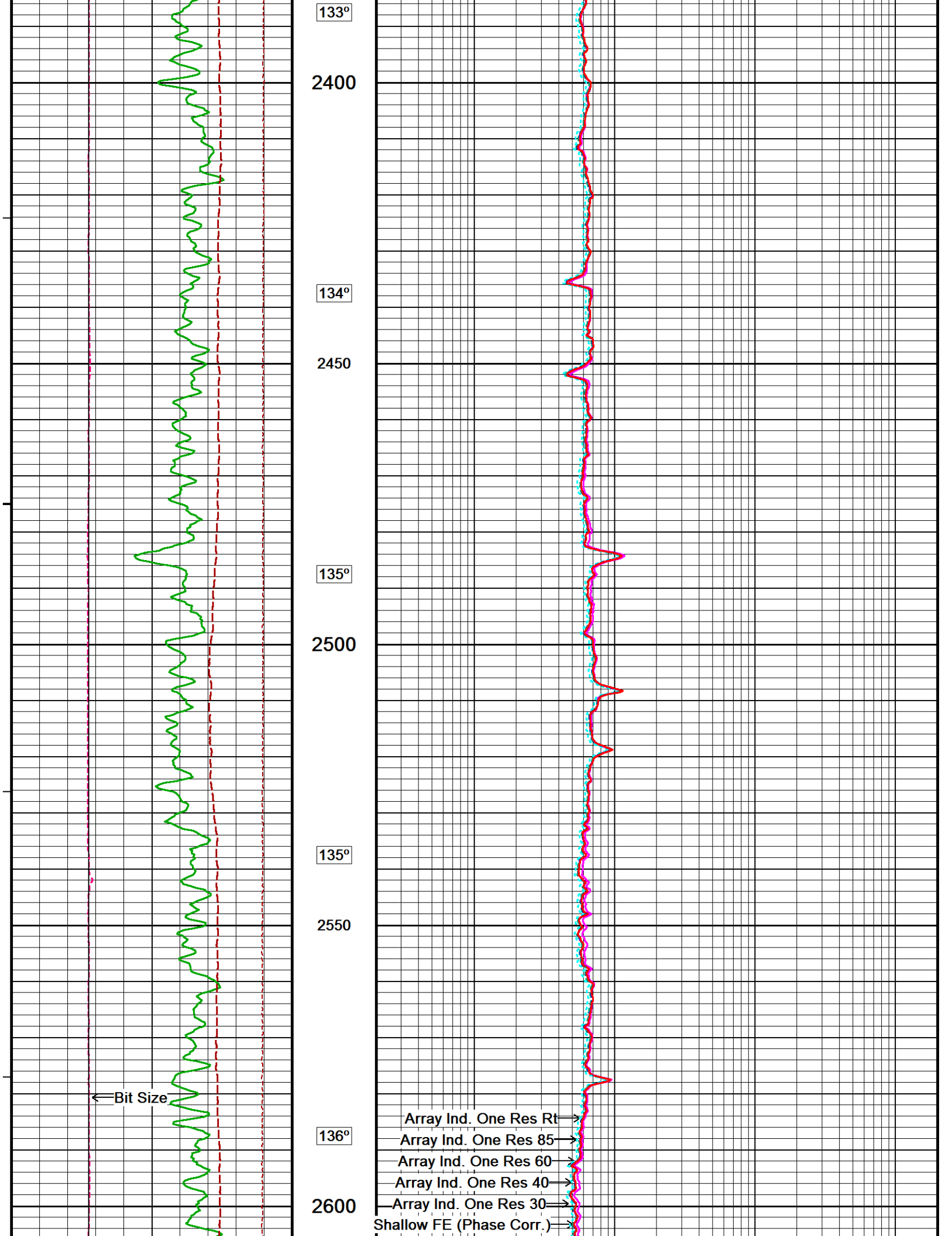

118°
1300
119°
1350
119°
Bit Size
1400
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)
Density Caliper
Spontaneous Potential
Gamma Ray
DST Borehole Tension
120°
1450
121°
1500

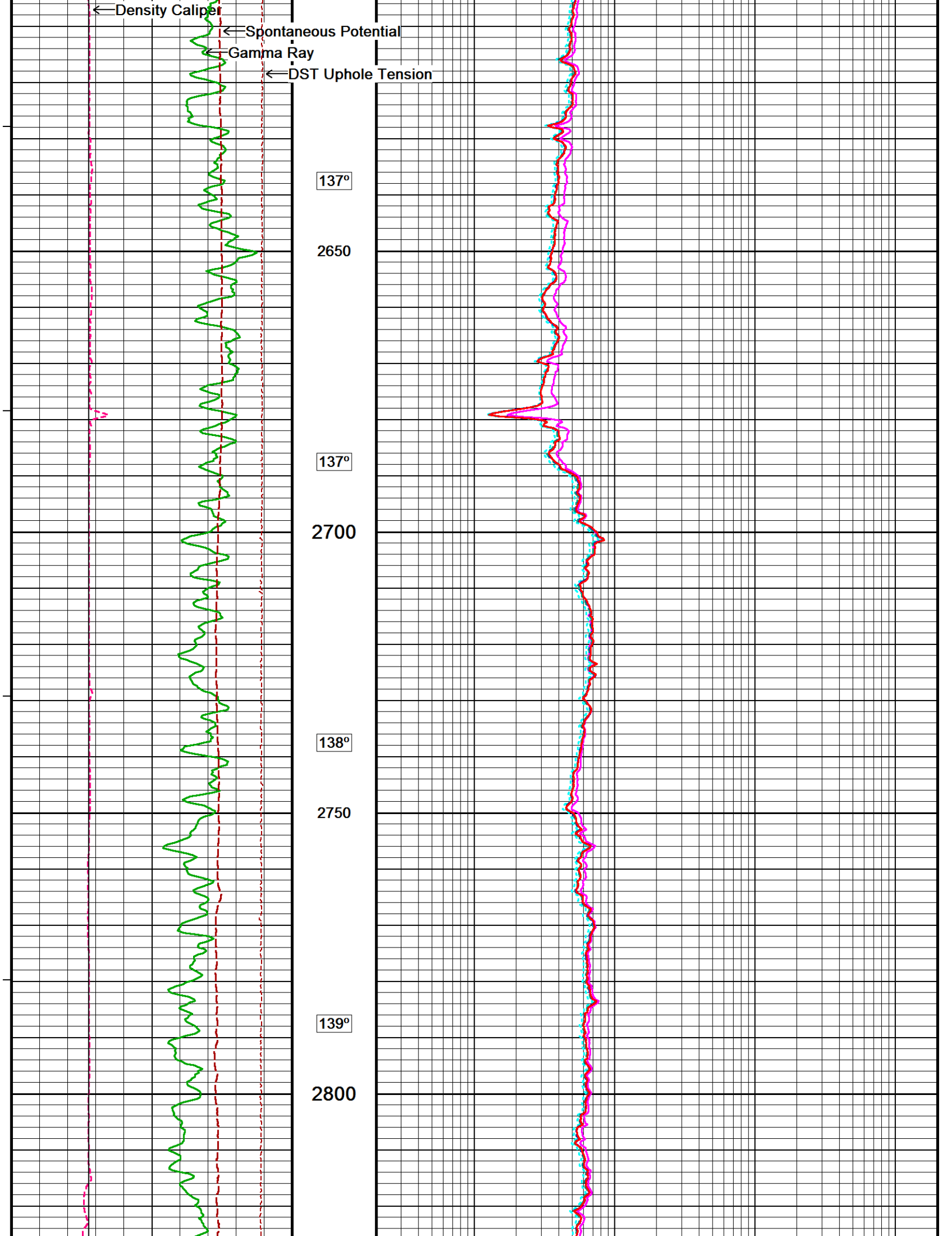

122°
1550
124°
1600
124°
1650
125°
1700

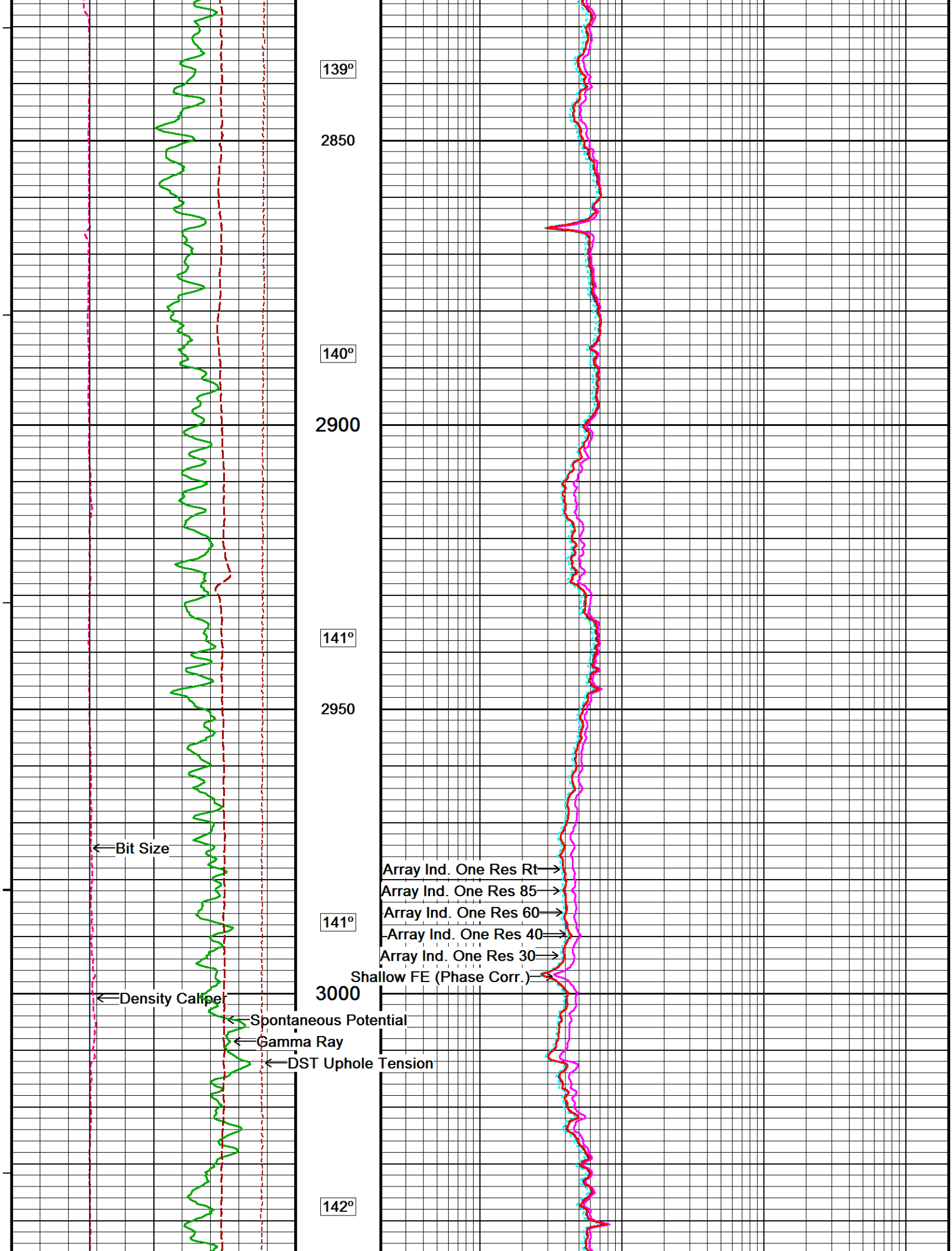

126°
1750
127°
Bit Size
1800
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
127°
1850
128°
1900
128°

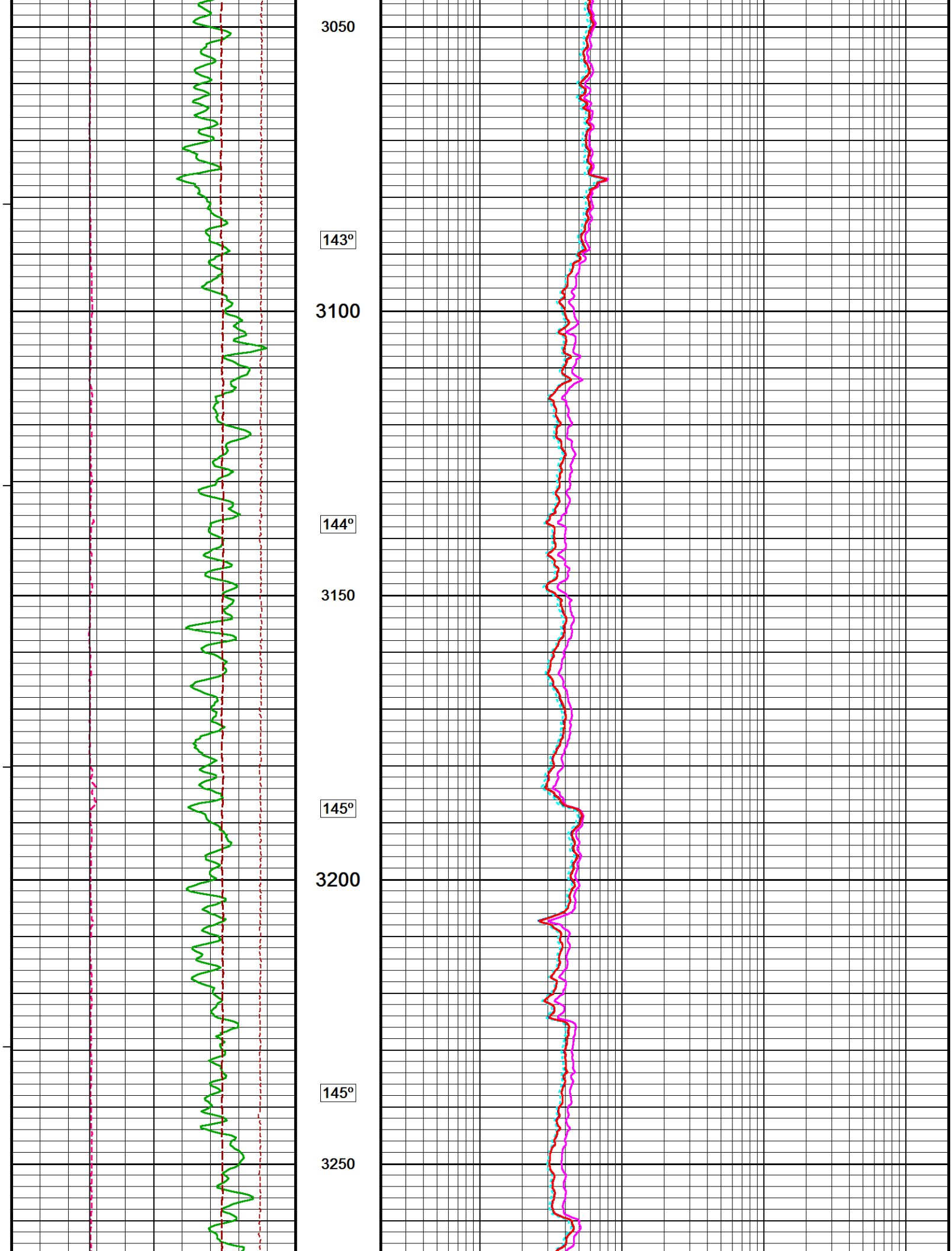

1950
129°
2000
130°
2050
130°
2100
131°
2150

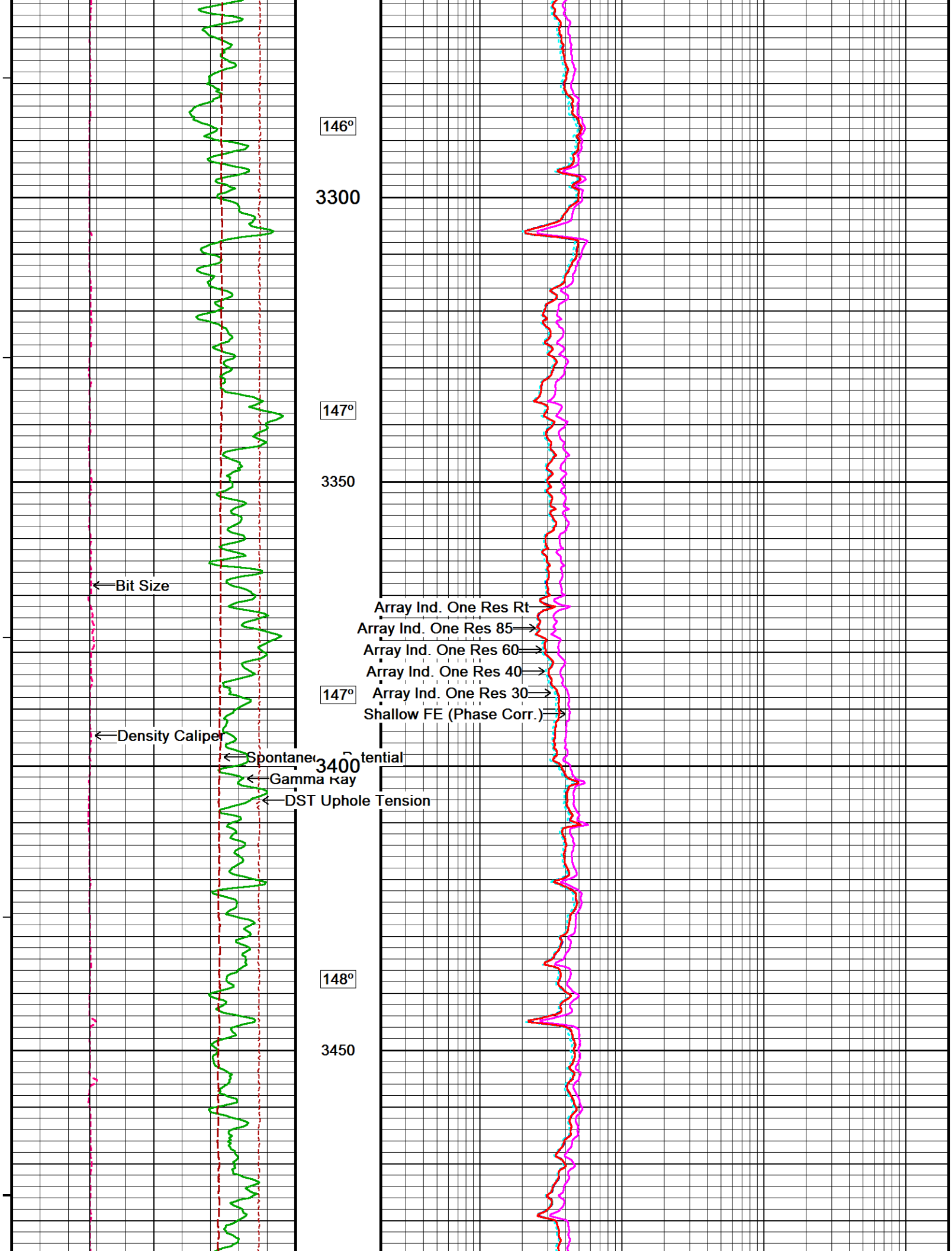

Bit Size
131°
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
2200
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
132°
2250
132°
2300
133°
2350

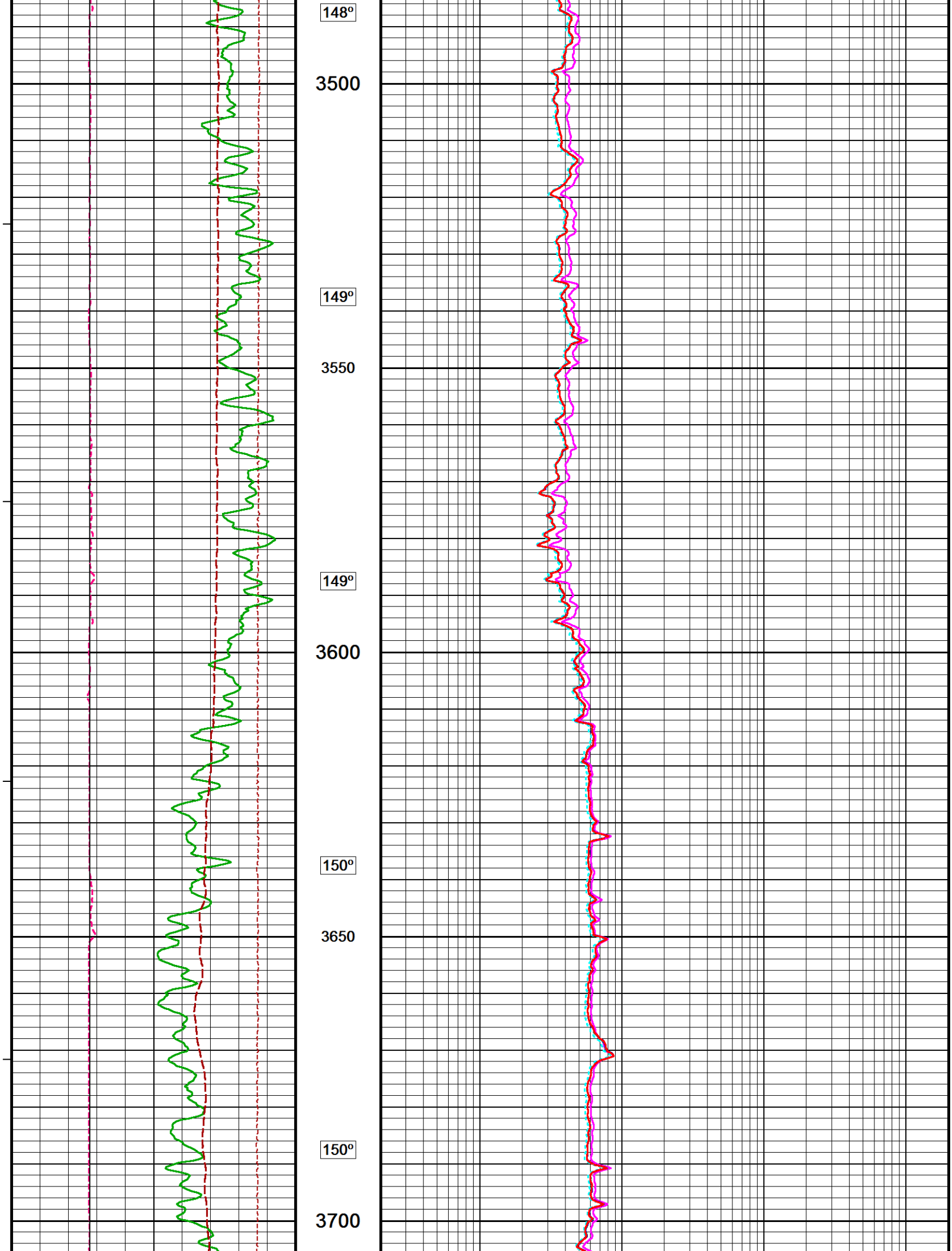

133°
2400
134°
2450
135°
2500
135°
2550
136°
2600
Bit Size
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)

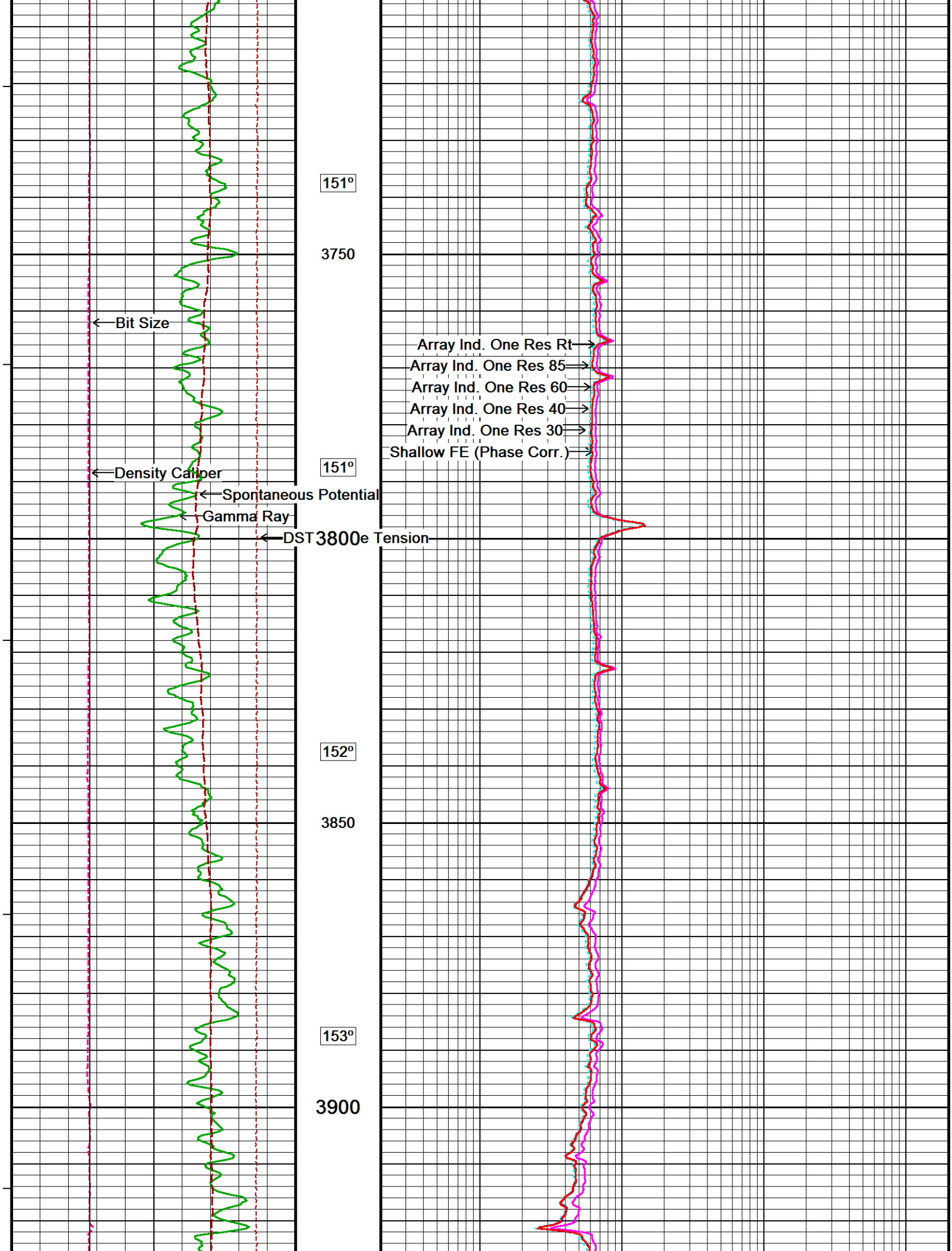

←Density Caliper
←Spontaneous Potential
←Gamma Ray
←DST Uphole Tension
137°
2650
137°
2700
138°
2750
139°
2800

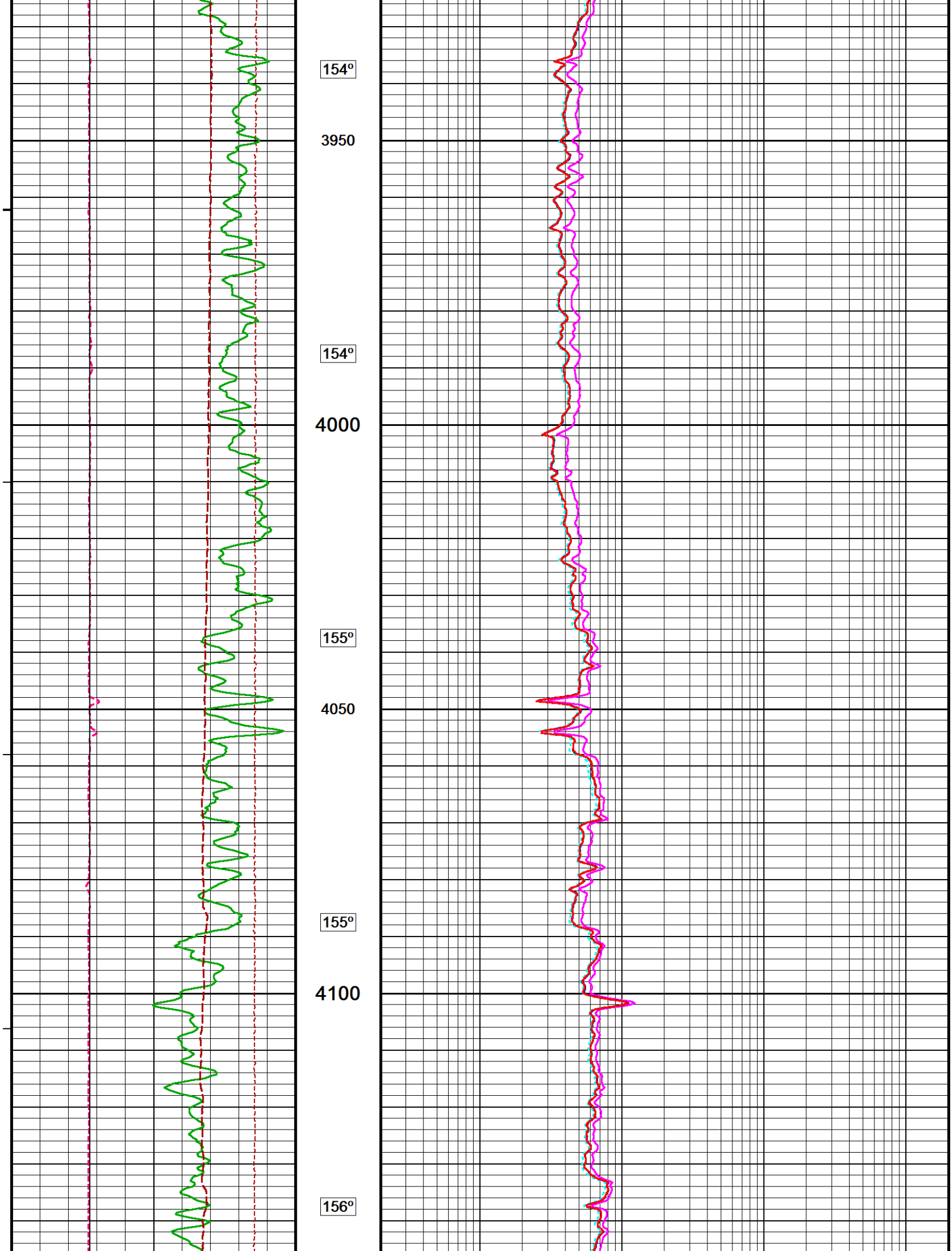

139°
2850
140°
2900
141°
2950
141°
3000
142°
←Bit Size
←Density Caliper
←Spontaneous Potential
←Gamma Ray
←DST Uphole Tension
Array Ind. One Res Rt→
Array Ind. One Res 85→
Array Ind. One Res 60→
Array Ind. One Res 40→
Array Ind. One Res 30→
Shallow FE (Phase Corr.)→

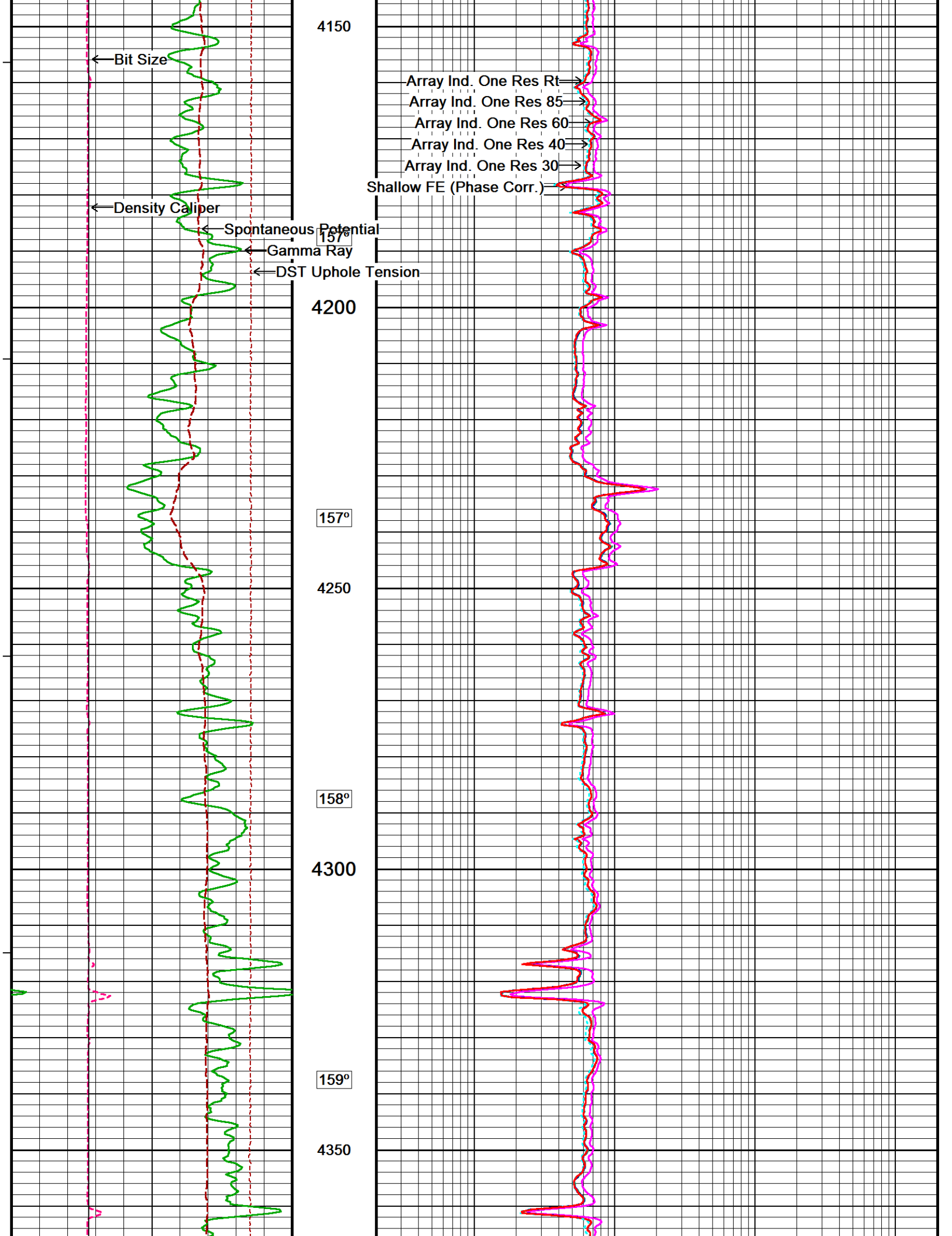

3050
143°
3100
144°
3150
145°
3200
145°
3250

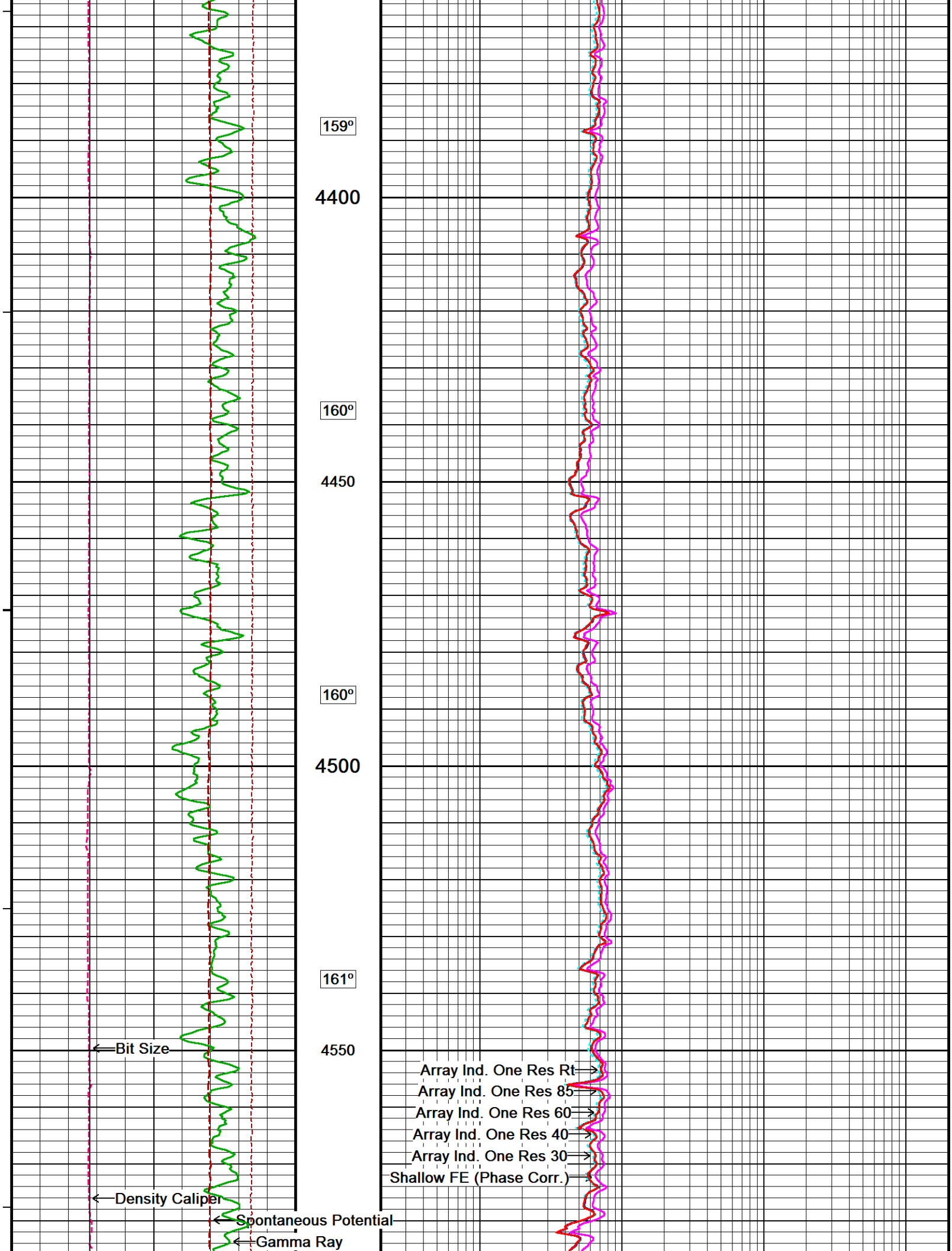

146°
3300
147°
3350
←Bit Size
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
147°
Array Ind. One Res 30
Shallow FE (Phase Corr.)
←Density Caliper
←Spontaneo tential
3400
←Gamma Ray
←DST Uphole Tension
148°
3450

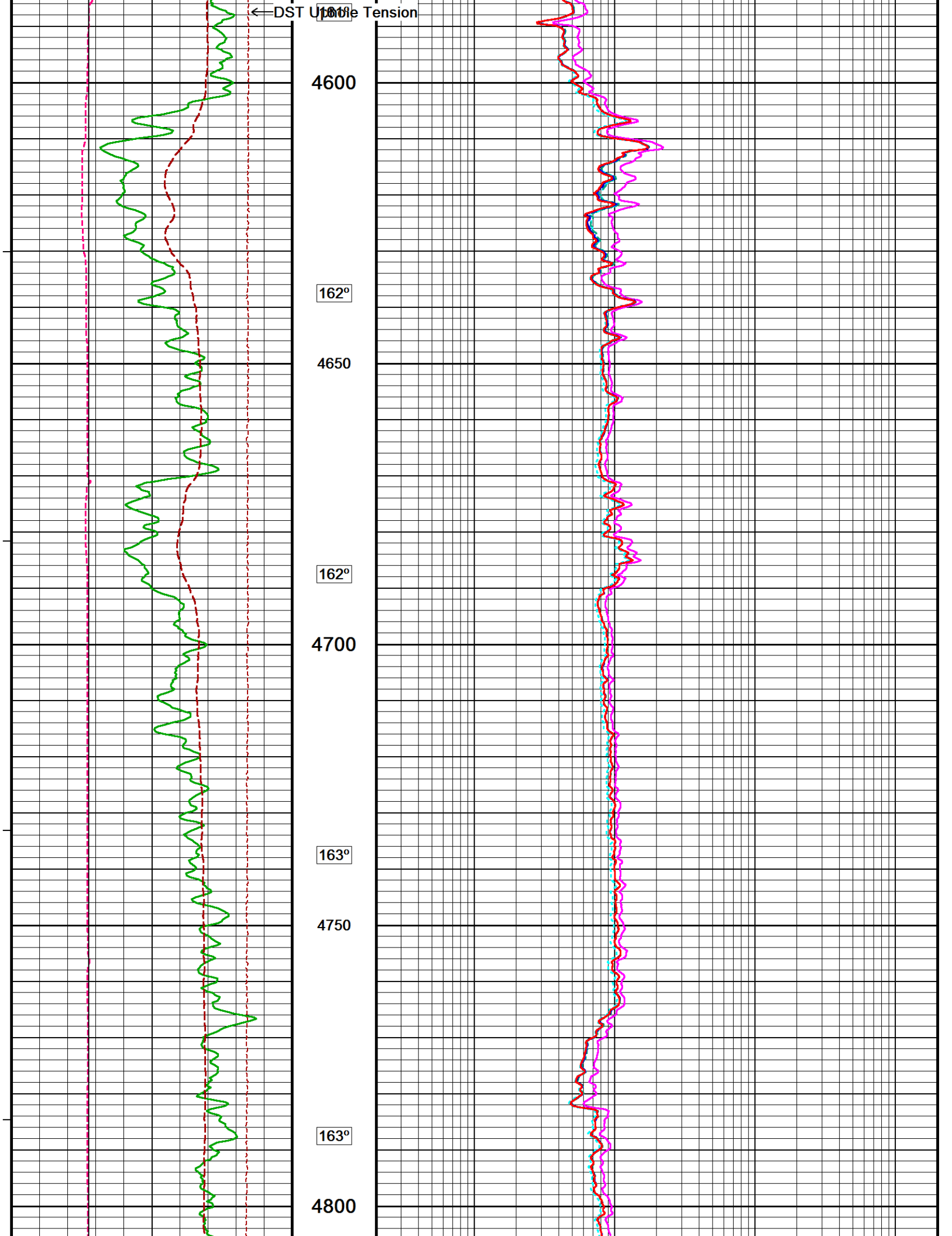

148°
3500
149°
3550
149°
3600
150°
3650
150°
3700

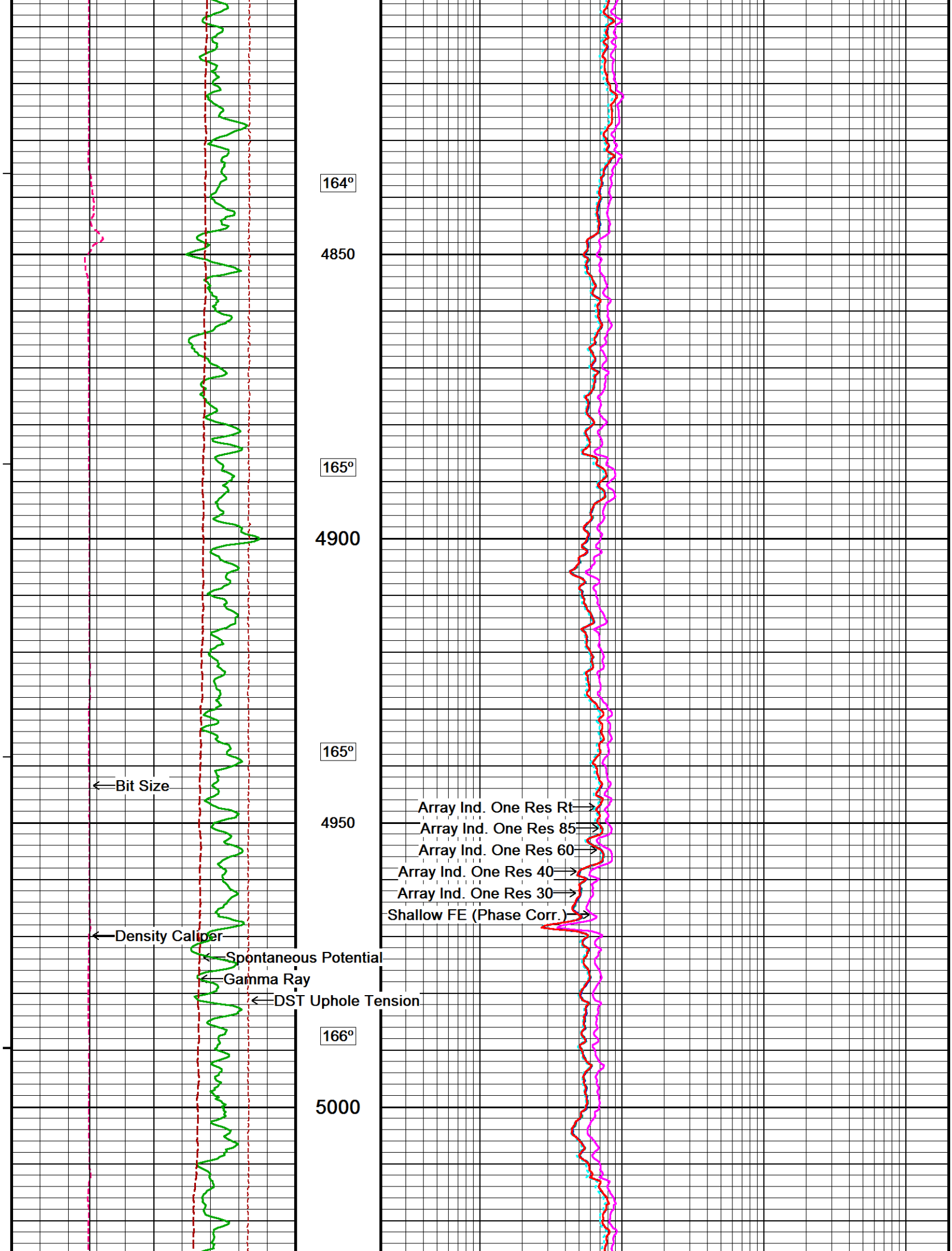

151°
3750
Bit Size
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)
151°
Density Caliper
Spontaneous Potential
Gamma Ray
DST
3800
e Tension
152°
3850
153°
3900

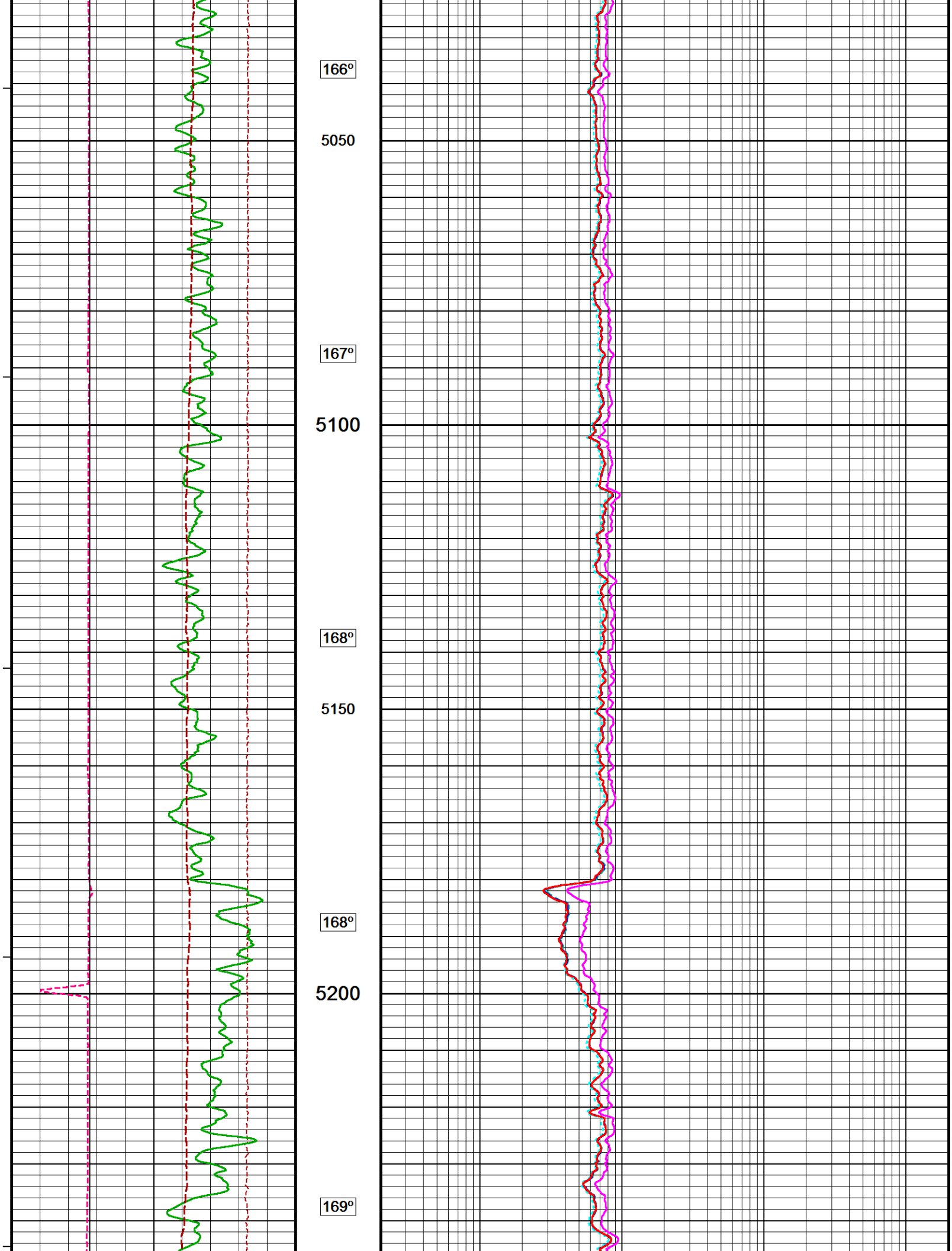

154°
3950
154°
4000
155°
4050
155°
4100
156°

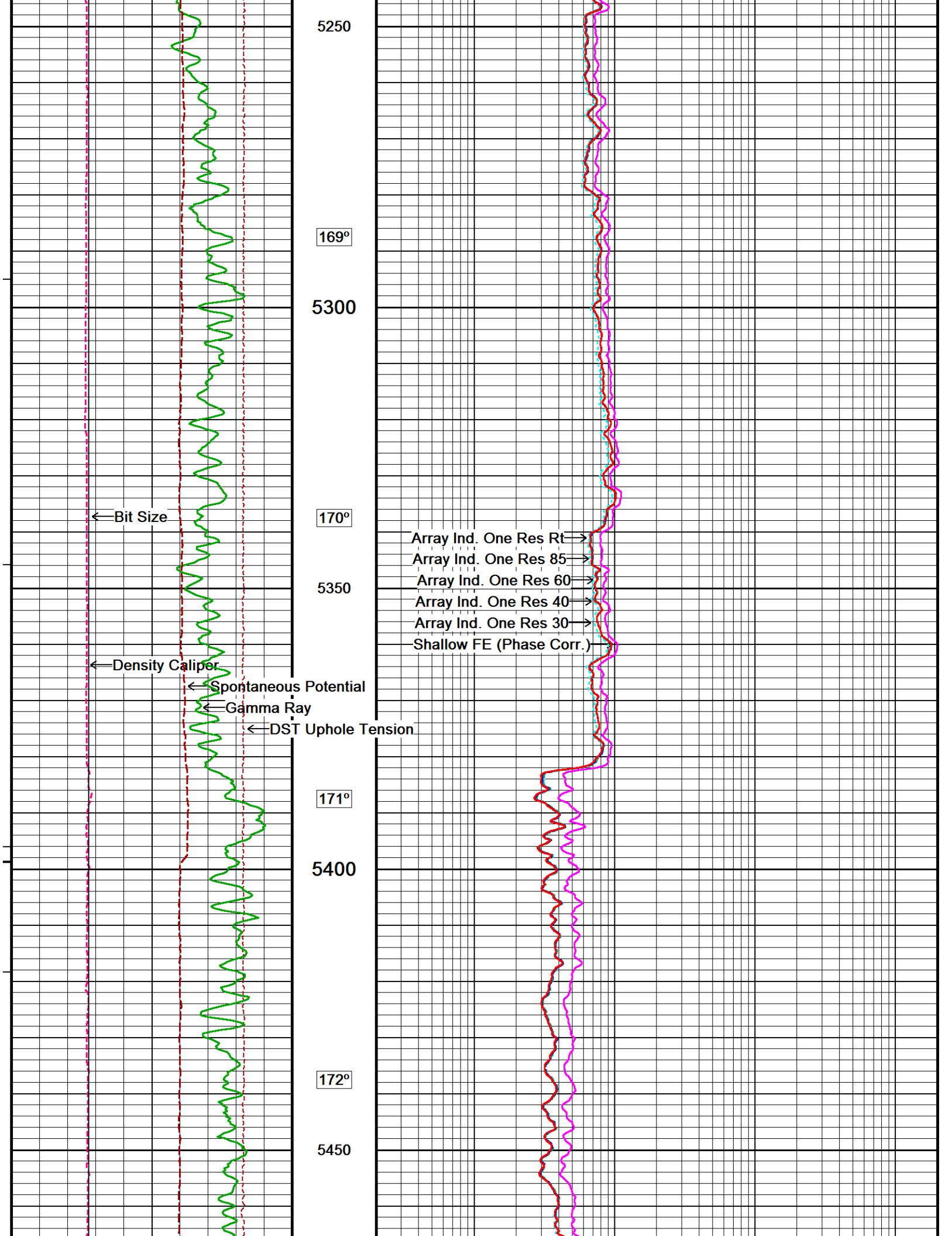

4150
Bit Size
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)
Density Caliper
Spontaneous Potential
157°
Gamma Ray
DST Uphole Tension
4200
157°
4250
158°
4300
159°
4350

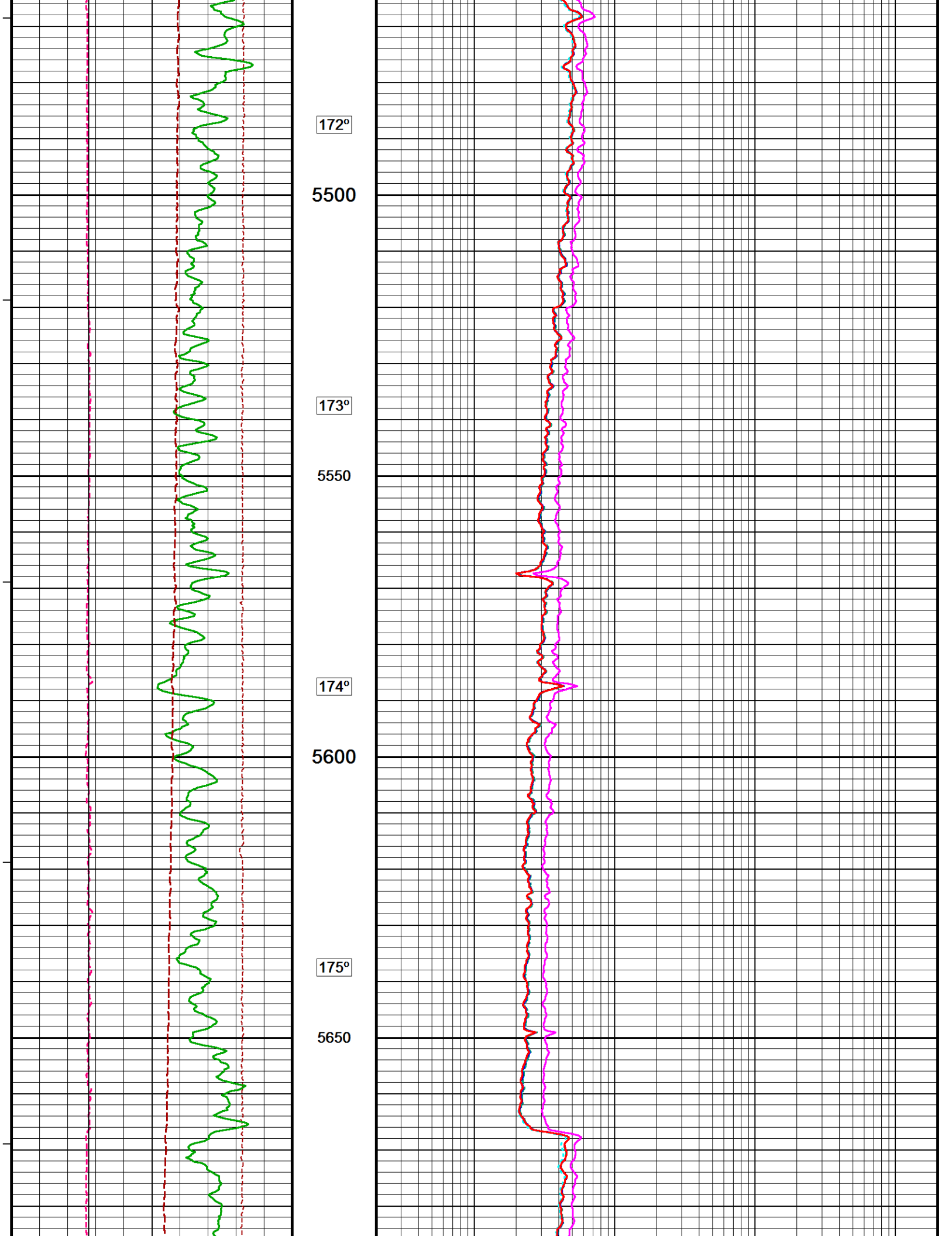

159°
4400
160°
4450
160°
4500
161°
4550
Bit Size
Density Caliper
Spontaneous Potential
Gamma Ray
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)

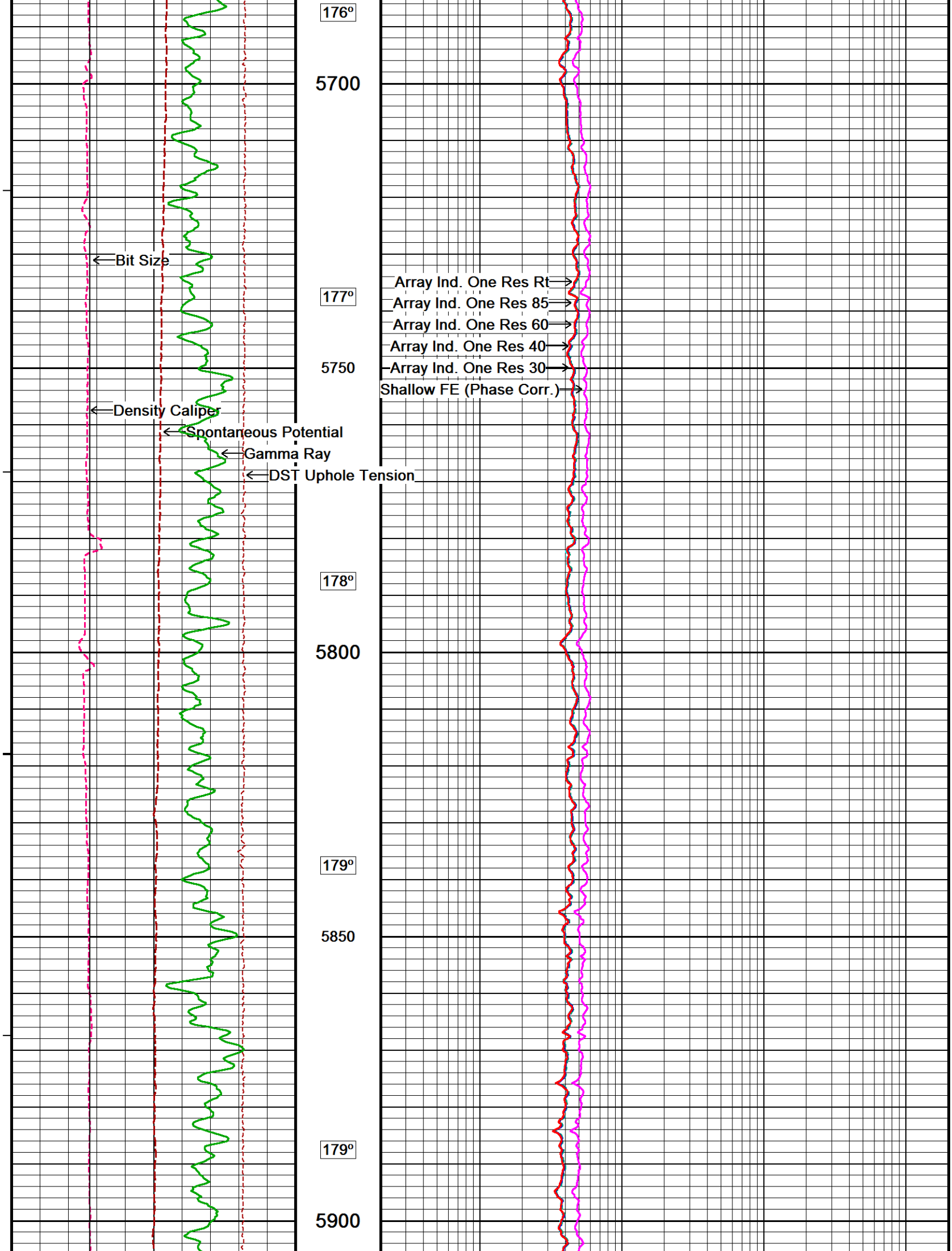

←DST Upside Tension
4600
162°
4650
162°
4700
163°
4750
163°
4800

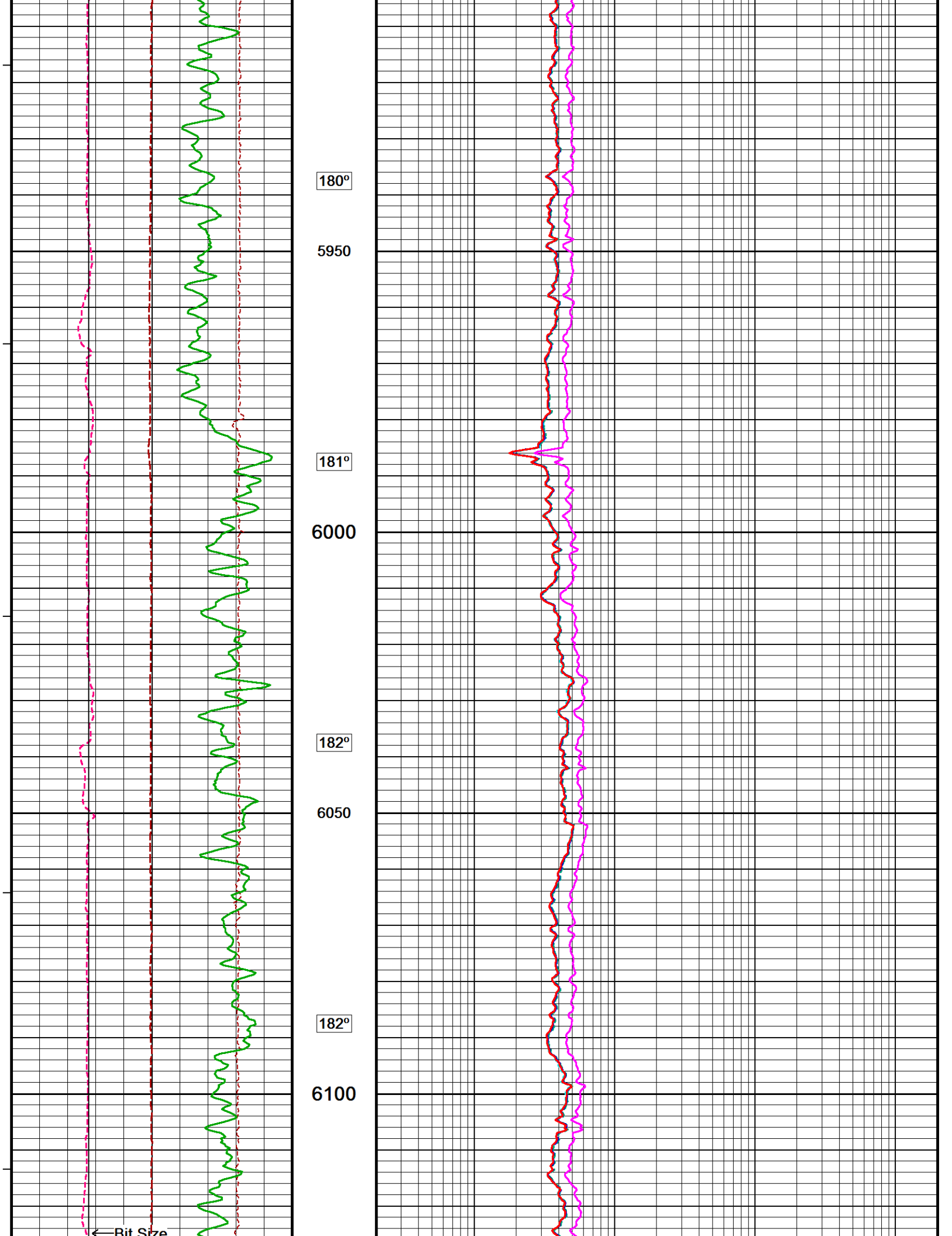

164°
4850
165°
4900
165°
4950
166°
5000
Bit Size
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)

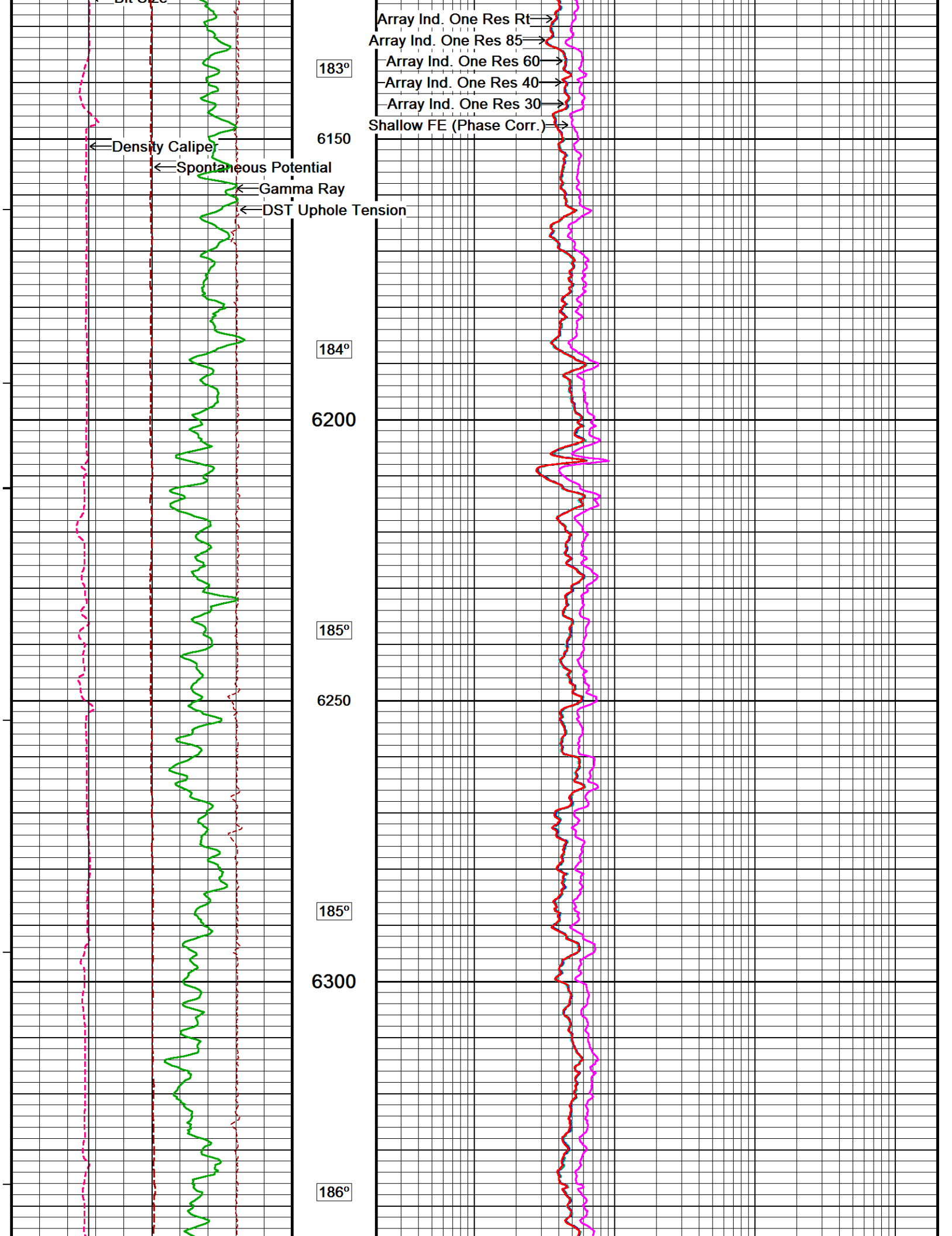

166°
5050
167°
5100
168°
5150
168°
5200
169°

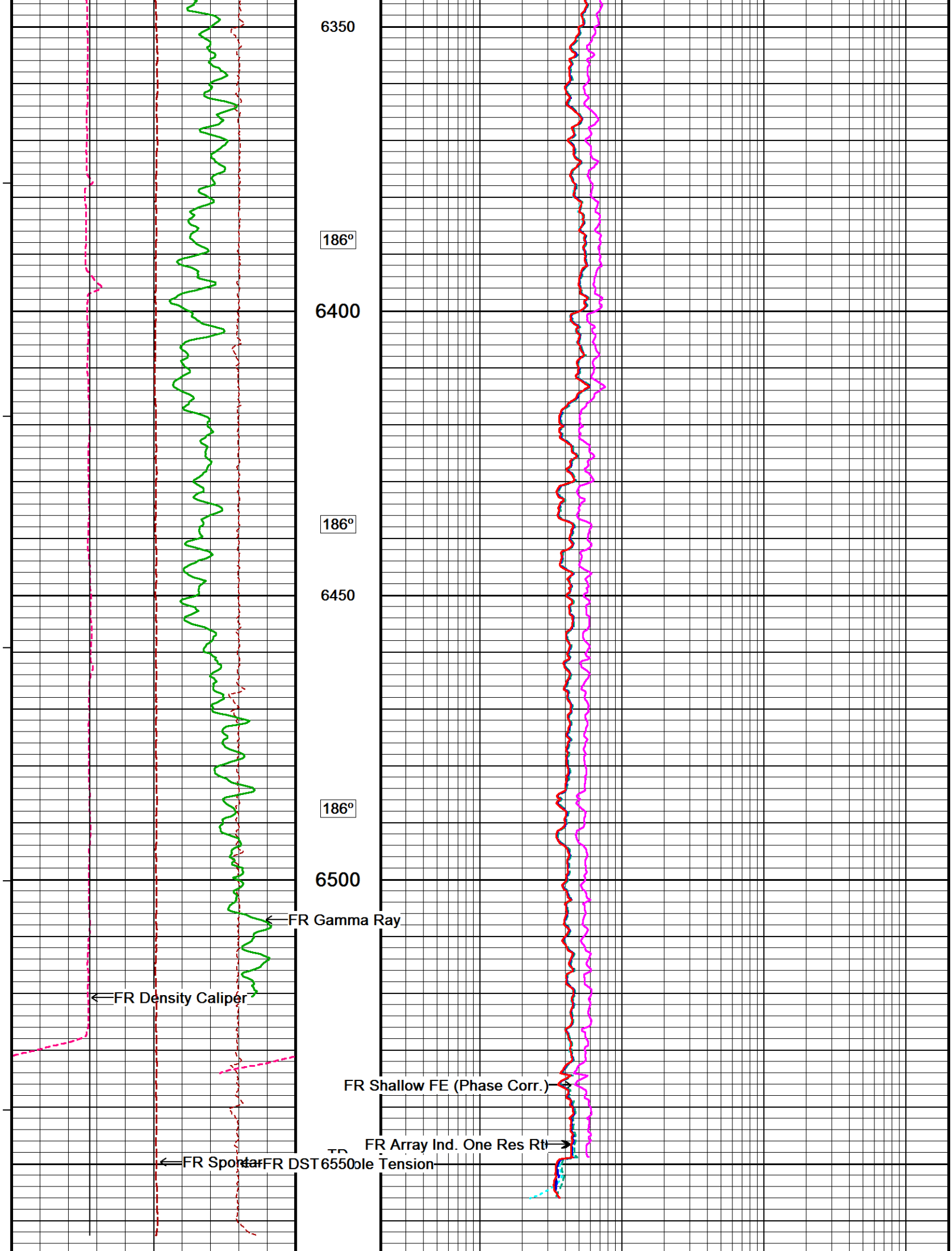

5250
169°
5300
170°
Bit Size
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)
5350
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
171°
5400
172°
5450

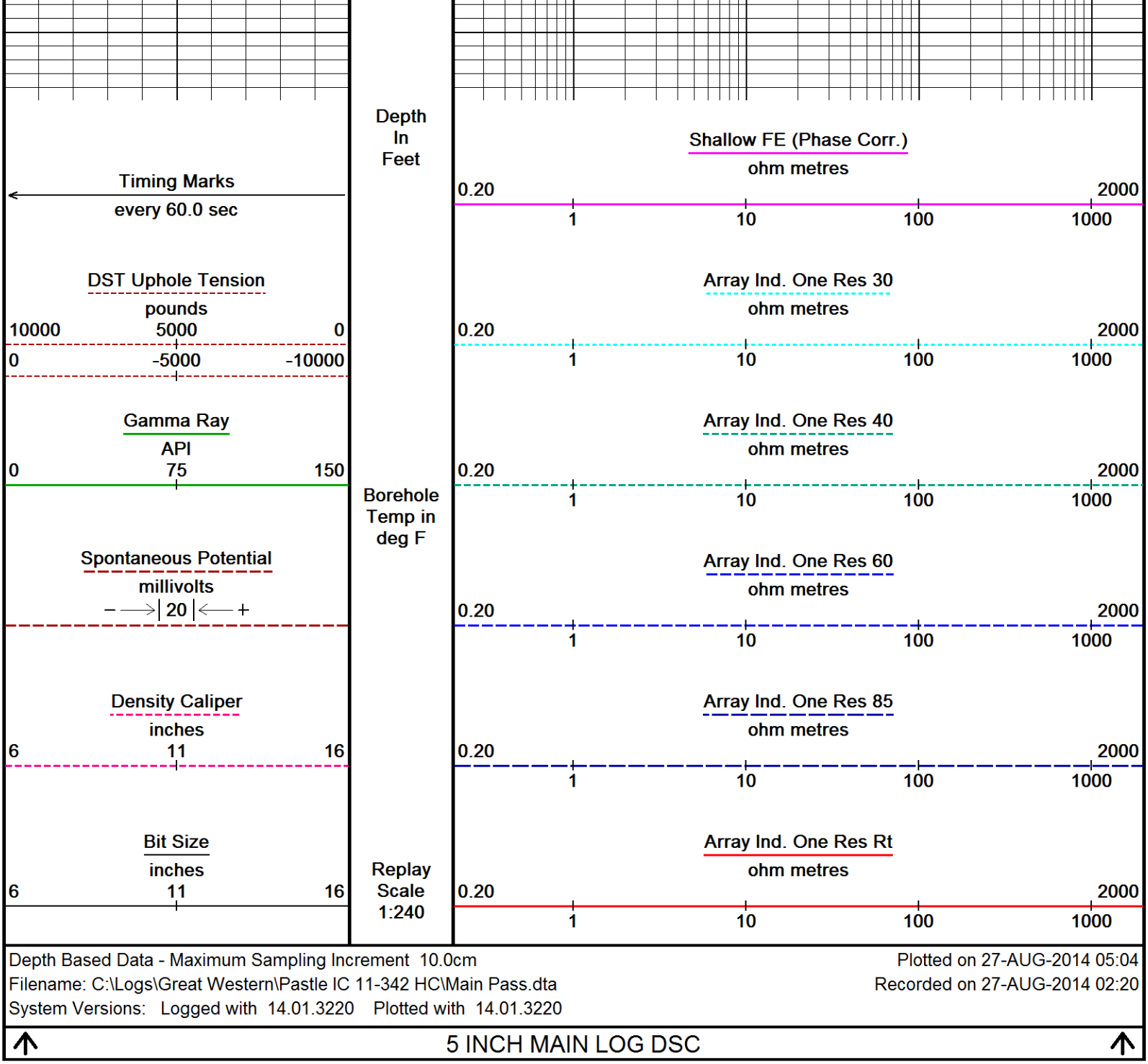

172°
5500
173°
5550
174°
5600
175°
5650


176°
5700
Bit Size
177°
Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
5750
Array Ind. One Res 30
Shallow FE (Phase Corr.)
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
178°
5800
179°
5850
179°
5900


180°
5950
181°
6000
182°
6050
182°
6100
Bit Size


Array Ind. One Res Rt
Array Ind. One Res 85
Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Shallow FE (Phase Corr.)
183°
6150
Density Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
184°
6200
185°
6250
185°
6300
186°


6350
186°
6400
186°
6450
186°
6500
FR Gamma Ray
FR Density Caliper
FR Shallow FE (Phase Corr.)
FR Array Ind. One Res Rt
FR Sonar
FR DST 6550
ole Tension

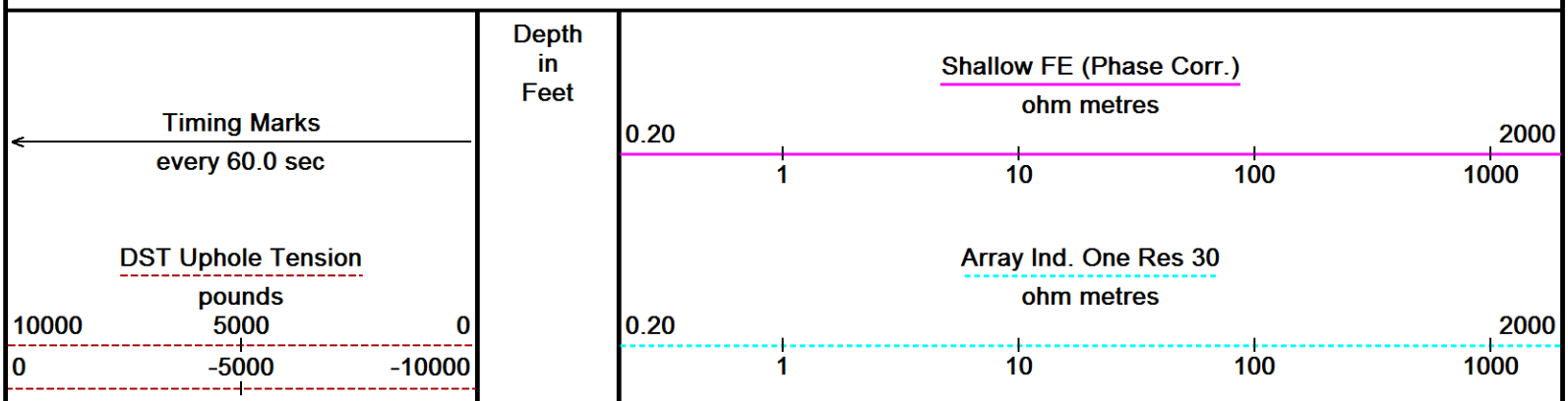


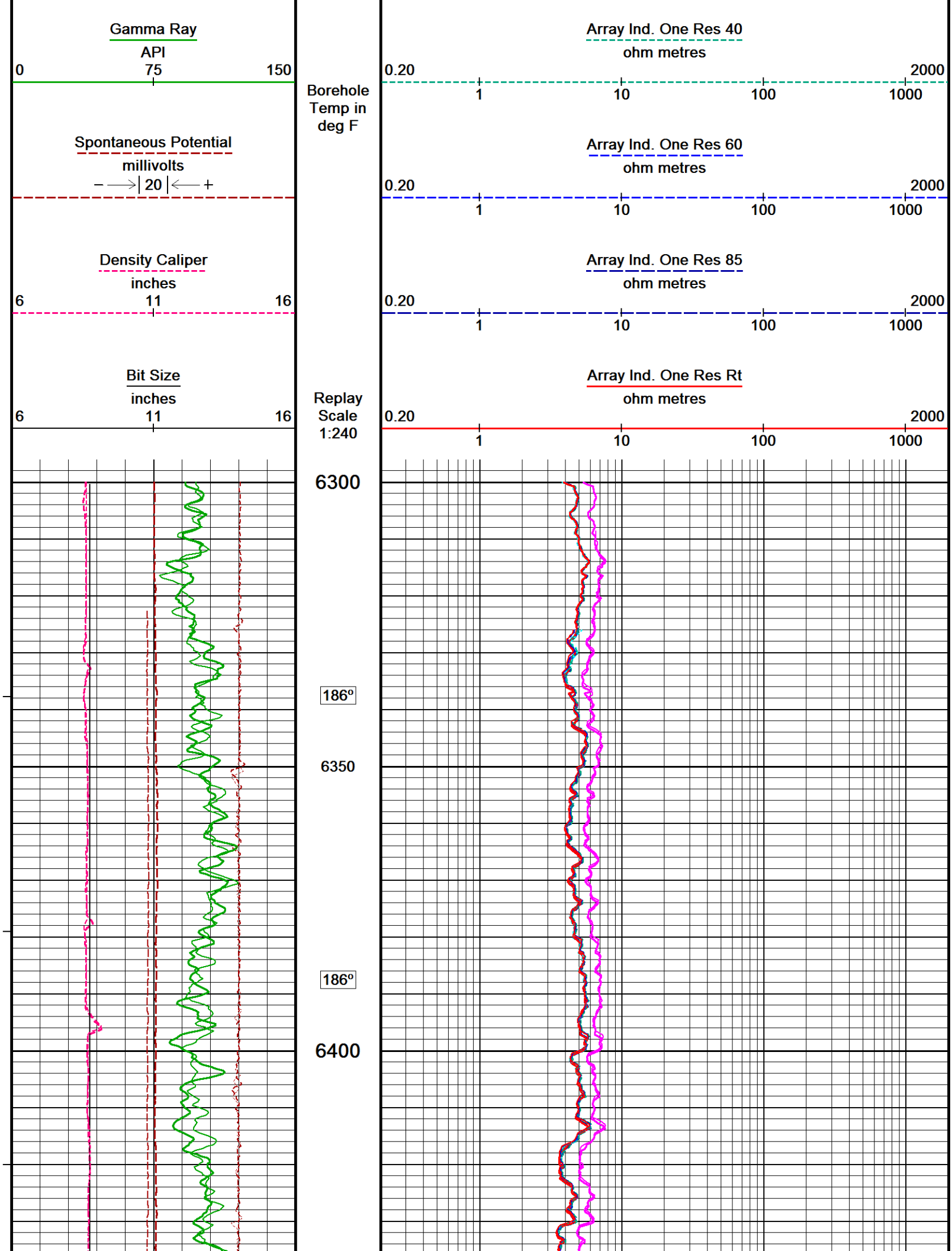
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 27-AUG-2014 05:04
Filename: C:\Logs\Great Western\Pastle IC 11-342 HC\Main Pass.dta — Recorded on 27-AUG-2014 02:20
System Versions: Logged with 14.01.3220 Plotted with 14.01.3220

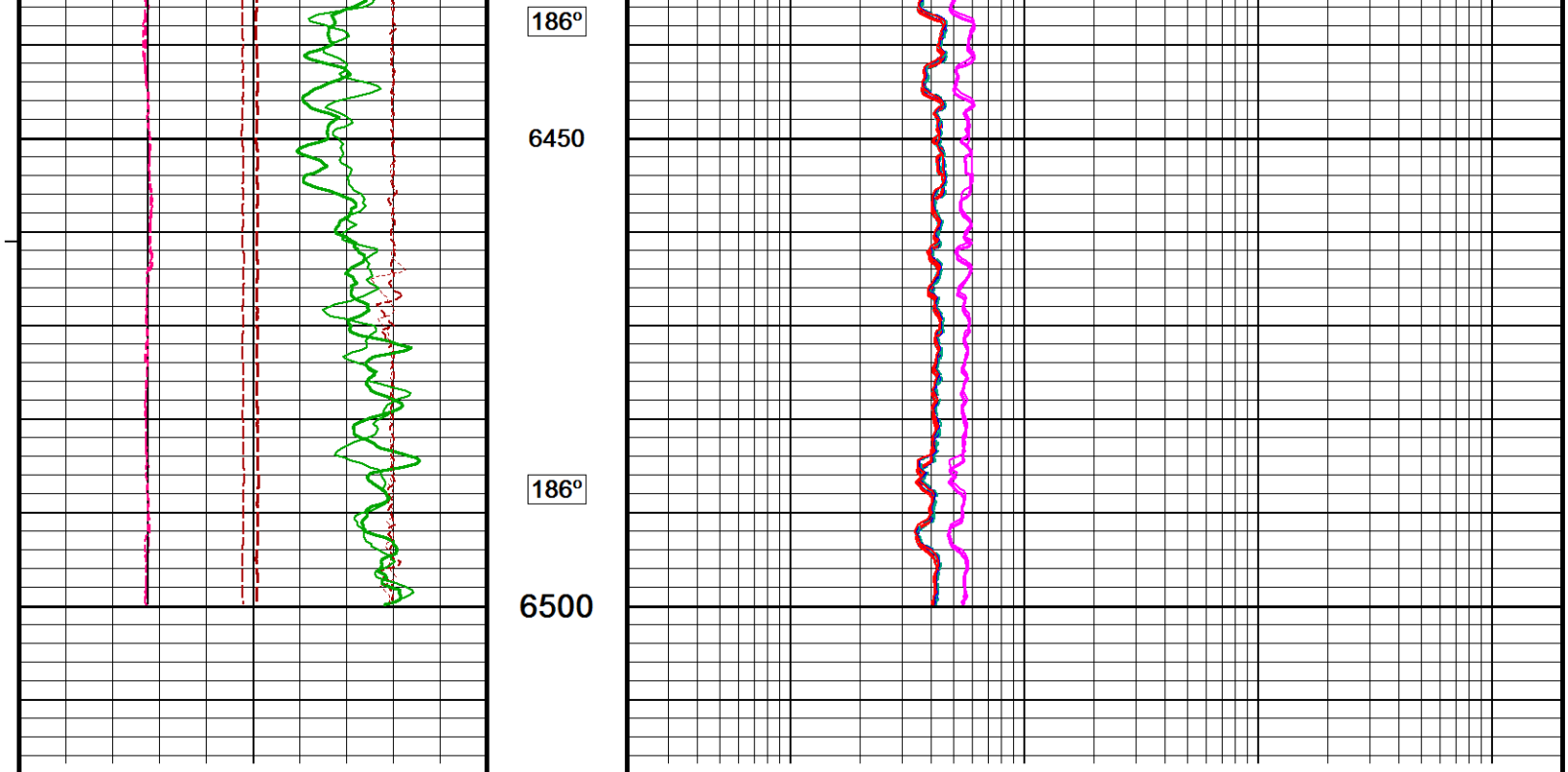
5 INCH MAIN LOG DSC

OVERLAY

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 27-AUG-2014 05:04
Filename: C:\Logs\Great Western\Pastle IC 11-342 HC\Main Pass.dta — Recorded on 27-AUG-2014 02:20
Filename: C:\Logs\Great Western\Pastle IC 11-342 HC\Repeat.dta — Recorded on 27-AUG-2014 02:08
System Versions: Logged with 14.01.3220 Plotted with 14.01.3220




Gamma Ray
API
0
75
150
Spontaneous Potential
millivolts
20
Density Caliper
inches
6
11
16
Bit Size
inches
6
11
16
Borehole Temp in deg F
Replay Scale 1:240
6300
186°
6350
186°
6400
Array Ind. One Res 40
ohm metres
0.20
2000
1
10
100
1000
Array Ind. One Res 60
ohm metres
0.20
2000
1
10
100
1000
Array Ind. One Res 85
ohm metres
0.20
2000
1
10
100
1000
Array Ind. One Res Rt
ohm metres
0.20
2000
1
10
100
1000



Timing Marks
every 60.0 sec

DST Uphole Tension
pounds
10000 5000 0
0 -5000 -10000

Gamma Ray
API
0 75 150

Spontaneous Potential
millivolts
– → | 20 | ← +

Density Caliper
inches
6 11 16

Bit Size
inches
6 11 16

Depth in Feet

Borehole Temp in deg F

Replay Scale 1:240

Shallow FE (Phase Corr.)
ohm metres
0.20 2000
1 10 100 1000

Array Ind. One Res 30
ohm metres
0.20 2000
1 10 100 1000

Array Ind. One Res 40
ohm metres
0.20 2000
1 10 100 1000

Array Ind. One Res 60
ohm metres
0.20 2000
1 10 100 1000

Array Ind. One Res 85
ohm metres
0.20 2000
1 10 100 1000

Array Ind. One Res Rt
ohm metres
0.20 2000
1 10 100 1000

Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Logs\Great Western\Pastle IC 11-342 HC\Main Pass.dta
Filename: C:\Logs\Great Western\Pastle IC 11-342 HC\Repeat.dta
System Versions: Logged with 14.01.3220 Plotted with 14.01.3220

Plotted on 27-AUG-2014 05:04
Recorded on 27-AUG-2014 02:20
Recorded on 27-AUG-2014 02:08

BEFORE SURVEY CALIBRATION

C:\Logs\Great Western\Pastle IC 11-342 HC\Setup.dta

General Constants All 000

Last Edited on 27-AUG-2014,01:27

General Parameters		
Mud Resistivity	0.920	ohm-metres
Mud Resistivity Temperature	104.200	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

High Resolution Temperature Calibration MCG-D.K 424

Field Calibration on 08-NOV-2012,15:14

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	200.00	200.00

High Resolution Temperature Constants MCG-D.K 424

Last Edited on 08-NOV-2012,15:14

Pre-filter Length	11

Gamma Calibration MCG-D.K 424

Field Calibration on 26-AUG-2014 16:11

	Measured	Calibrated (API)
Background	133	92
Calibrator (Gross)	1450	1004
Calibrator (Net)	1317	912

Gamma Constants MCG-D.K 424

Last Edited on 26-AUG-2014,15:54

Gamma Calibrator Number	GRC-072	
Mud Density	1.20	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

FE Calibration MFE-B.A 219

Base Calibration on 27-MAY-2014 15:11
Field Check on 27-AUG-2014 00:57

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	967.5	126.8
Base Check		280.4
Field Check		280.6

FE Constants MFE-B.A 219

Last Edited on 27-AUG-2014,00:56

Running Mode	No Sleeve	
MFE K Factor	0.1268	
Caliper Source for FE correction	Density Caliper	
Caliper Value for FE correction	N/A	inches
Rm Source for FE correction	Temperature Corr	

Rm Source for FE correction	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Stand-off	0.5	inches

Induction Calibration MAI-B.A 269

Base Calibration on 14-JUL-2008,16:40
Field Check on 27-AUG-2014 00:59

Base Calibration

Test Loop Calibration	Measured		Calibrated (mmho/m)	
Channel	Low	High	Low	High
1	17.5	492.3	9.3	966.2
2	5.8	384.1	7.6	821.4
3	3.3	264.1	5.2	566.0
4	2.7	135.6	2.6	279.2

Array Temperature 27.0 Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			15.8	3703.3
2			33.8	3520.8
3			31.0	3006.0
4			19.4	2057.8
Deep			16.8	1924.6
Medium			47.2	3989.8
Shallow			53.5	5256.1

Array Temperature 75.5 Deg F

Induction Constants MAI-B.A 269

Last Edited on 27-AUG-2014,00:57

Induction Model	RtAP-WBM	
Caliper for Borehole Corr.	Density Caliper	
Hole Size for Borehole Correction	N/A	inches
Tool Centred	No	
Stand-off Type	Fins	
Stand-off	0.50	inches
Number of Fins on Stand-off	6.0000	
Stand-off Fin Angle	60.00	degrees
Stand-off Fin Width	0.5000	inches
Borehole Corr. Rm Source	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000

Calibration Site Corrections

Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

Apparent Porosity and Water Saturation Constants

Archie Constant (A)	1.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

Caliper Calibration MPD-D.A 460

Base Calibration on 20-AUG-2014 15:50
Field Calibration on 26-AUG-2014 15:44

Base Calibration

Reading No	Measured	Calibrator Size (in)

1	18190	3.98
2	26865	5.96
3	35613	7.97
4	43752	9.84
5	53006	11.91
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.94	7.97

DOWNHOLE EQUIPMENT

C:\Logs\Great Western\Pastle IC 11-342 HC\Setup.dta

CBH-C, Cablehead, 11 pin
CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

SHA-J.B Compact Swivel Head Adaptor
SHA-J.B 679 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.K 424 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Neutron
MDN-B.A 296 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-D.A 460 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

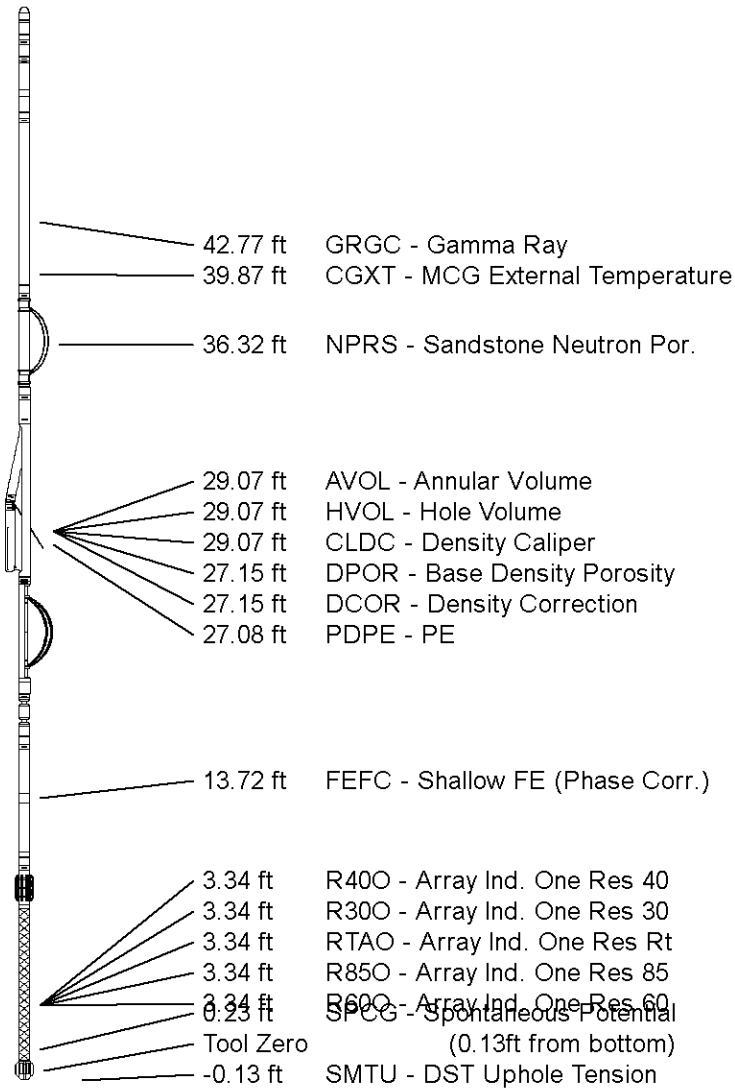
MIS-D.B Compact Inline Bowspring sub
MIS-D.B 657 LG: 5.70 ft WT: 33.1 lb OD: 2.244 in

SKJ-E.A Compact Knuckle Joint
SKJ-E.A 409 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric
MFE-B.A 219 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-B.A 269 LG: 10.81 ft WT: 48.5 lb OD: 2.240 in

Total Length: 52.75 ft Weight: 405.7 lb



COMPANY	GREAT WESTERN O&G Co
WELL	PASTLE IC 22-342 HC
FIELD	WATTENBERG
PROVINCE/COUNTY	WELD
COUNTRY/STATE	U.S.A / COLORADO

Elevation Kelly Bushing	4943.00	feet	First Reading	6547.00	feet
Elevation Drill Floor	4943.00	feet	Depth Driller	7605.00	feet
Elevation Ground Level	4927.00	feet	Depth Logger	6550.00	feet

ARRAY INDUCTION-RTAP

Weatherford®

SHALLOW FOCUSED ELECTRIC LOG